Issued Weekly by the

Hill Publishing Company

JOHN A. HILL, Pres. and Treas. ROB'T MCKEAN, Sec'y.

505 Pearl St., New York.
6 Bouverie St., London, E. C.
Unter den Linden 71, Berlin.

Subscriptions payable in advance, $5.00 a year for 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii, or the Philippines, $6.50 in Canada.

To foreign countries, including postage, $8.00 or its equivalent, 33 shillings: 33 marks: or 40 francs.

Notice to discontinue should be written to the New York Office in every instance.

Advertising copy should reach New York Office by Thursday of week before date of issue.

Entered at New York Post Office as mail matter of the second class.

Cable Address, Engminjour, N. Y.

CIRCULATION STATEMENT

During 1910 *we printed and circulated* 526,500 *copies of* THE ENGINEERING AND MINING JOURNAL.

Our circulation for August, 1911, *averaged* 9750 *copies per issue.*

September 2..... 10,500

None sent free regularly, no back numbers. Figures are live, net circulation.

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Illustrated.

The Engineering and Mining Journal

Vol. 92. SEPTEMBER 2, 1911. No. 10.

Valuation of Michigan Mines

Governor Osborn, of Michigan, did good service in inaugurating plans for a readjustment of the valuation of property in that State for the purposes of taxation, contemplating the employment of experts in each branch and thereby acquiring scientific information, which, of course, is vastly better than the haphazard guesswork of the ordinary tax appraiser. In the fulfilment of this plan, the State tax commission employed J. R. Finlay, of New York, to report upon the mining property in the State. Upon this work, with a corps of assistants, Mr. Finlay has been engaged during this summer. His work was completed about a fortnight ago and part of his conclusions have been given out at Lansing to the press. His figures as to the copper mines have been regarded as sensational, although in fact they are so only in their rude rupture of some foolish ideas popularly held. Mr. Finlay is sane, not sensational.

There are two classes of people who doubtless are disappointed. These are the farmers of the lower peninsula, who would like to see a heavy burden of taxation put upon the copper mines; and the stock jobbers of Boston, who would like to maintain quotations that have no direct relation to actual value. To the latter, Mr. Finlay's figures must have been a bombshell. As to the real mining men of the region, we imagine that their feelings are rather mixed. When the appraisal was begun, there was more or less alarm that such a report would be made as would lead to an increase in taxation. The tendency of human nature to look at property in radically different ways when talking to bankers and to taxgatherers was strongly manifest. Nobody likes to depreciate the value of his own property, yet he does not want to pay any more taxes than he can help. However, it is surprising and not wholly agreeable to be scaled down to nothing at all, which has been the fate of some concerns.

Mr. Finlay's valuations of the Calumet & Hecla group of properties are lower in every case than those estimated by the engineers of the company in connection with the pending plan for consolidation. In the cases of some of the outside companies the results must be startling to stockholders. Thus, Quincy with 110,000 shares, which in 1910 sold at $66 to $92, is rated for taxation purposes at $3,250,000; Mohawk, with 100,000 shares, selling in 1910 at $43 to $75, is rated at $3,500,000; Wolverine, with 60,000 shares, selling in 1910 at $102 to $150, is valued at $3,700,000; and Copper Range, with 384,335 shares, selling at $58 to $85, is valued at $7,665,000, insofar as its mining interests are concerned. Most remarkable is the case of the Lake property, whereof there are 100,000 shares, which in 1910 sold at $28½ to $94½, but is valued at only $300,000. Among the well known mines, Mr. Finlay considers the Franklin, Tamarack, Centennial, Victoria, Mass and Michigan to be of no value.

The great discrepancies in some of these cases is undoubtedly attributable to the principle upon which Mr. Finlay determined his figures. He has stated that his valuations represent only the worth of the mining business and do not include property of value for other purposes. They are based on an average cost of production, an average price of copper and an estimate of future life of the mines. When reliable data for an estimate in the last particular do not exist they cannot be manufactured. We think this was probably the case of the Lake mine, which is only in the initial stage of development. In such a case the stock market capitalizes great expectations, which may or may not materialize.

In general, Mr. Finlay makes an application of the principles of mine valuation that are employed by every mining engineer, and it is no matter for surprise to see stock-market valuations shrink under such tests. It is utterly ridiculous

that the stock of any mining company with an assured life of 20 years, even, should sell upon a basis of only a 6 per cent. dividend yield. In such a case the yield ought to be 10 per cent. With an assured life of less than 20 years, the yield ought to run up to 50 per cent. or even 100 per cent., according to the mine. Investors may expect to continue to lose their money to shrewder people until they get this principle into their heads.

We think that Mr. Finlay's report has been construed as unduly pessimistic with respect to the future of the copper mines of Lake Superior, the end of which, in most cases, he believes to be in plain sight. Of course, he refers only to the mines that are now developed, and not to the district as a whole. Considering the district as a whole, there is a range of great length, traversed by a series of lodes, which no one can reasonably consider to have been fully prospected. There are long stretches in which some new mines may be found in the course of time. During recent years we have witnessed the discovery and development of such good mines as the Baltic, Champion, Wolverine, Ahmeek and Allouez. Even now some promising prospecting is going on far to the south in the neighborhood of the Lake mine. While some of the old mines of Lake Superior will be exhausted during the next 20 years, we are inclined to think that the district as a whole will maintain itself and will be a large producer of copper long after the porphyry mines of the present day have been forgotten.

The Cost of Mining in Nicaragua

In this issue of the JOURNAL, Henry B. Kaeding gives some interesting figures on the cost of mining and milling in the eastern part of Nicaragua. The low costs will be a surprise to many, in whose minds the remoteness or inaccessibility of a mine is always associated with a high cost of operation.

We understand that a total cost of $2.70 per ton of ore treated is not at all remarkable, in comparison with the costs of the other mines of eastern Nicaragua where a fairly large tonnage is crushed each month. Indeed, it approaches the high limit for that country, not the low; yet that region resembles the mining districts on the west coast of Africa, such as Broomassie and Tarkwa rather than those of the temperate zones.

The unhealthy climate and difficulties of transportation are the greatest obstacles in the way of cheap mining in eastern Nicaragua. Malaria saps the vitality of native and foreigner alike; the difficulties and tediousness of transportation can only be realized by him who has spent two weeks in a canoe going up the rivers without a single opportunity to set foot ashore. Yet the costs of operations compare with the most favorably situated mines of the United States.

The conditions that have made possible the low costs that have been attained there are that the ore is easily mined, and so far no hoisting has been necessary. Cheap water power is available at most of the mines, but the lowest cost of which we have record is at a mine where steam power is used. Only a small proportion of the gold is recoverable by amalgamation, but the ores from most of the mines yield a high percentage of their gold content to cyanide treatment without fine grinding. What the costs of deep mining will be when ore has to be raised and water pumped is a problem none of the mine managers has yet been called upon to estimate. All the mines are treating so small a tonnage of ore that fixed charges bear an inordinate proportion to the total cost of mining and milling. It is probable that increasing the capacity of the mills will largely offset the greater cost of deep mining, at least for many years to come.

What has already been achieved speaks most favorably for mining in Nicaragua, and should draw attention to the opportunities that are there open to exploit profitably, low-grade gold-ore deposits.

Effect of Suspended Copper Operations

Erstwhile we remarked that the arithmetic of copper production comprises subtraction as well as addition. This is becoming apparent in the number of copper producers of 1910 that, for one reason or another, have suspended operation in 1911, the list comprising Balaklala, Granby, Imperial, Butte & Ballaklava, and Shattuck-Arizona. Besides these, the Mammoth and United Verde are operating at greatly reduced capacity. When compared with their outputs in 1910, the decrease of these producers is at the rate of about 75,000,000 lb. per annum, or a little upward of 6,000,000 lb. per month. This is rather more than the new product to be expected from Copper River, Miami, Ray and Chino during 1911. In view of the continued curtailment by the large producers, it does not look as if the total copper production of North America in 1911 would be any larger than it was last year.

The Hon. Mr. Stanley, who says that he is serving his country (opinions differ as to this) by remaining in Washington to investigate the Steel Trust, is now being "interviewed" to tell what he is going to do. As a possessor of nonsense he seems to be singularly eminent. Instead of mulling himself in Washington, how profitable it would be to him to go to Cambridge for a course in political economy under Professor Taussig! But we will give Mr. Stanley some expert information. If he seriously thinks that the proportion of the iron and steel business controlled by the Steel Corporation is dangerous to the public interest, there is a marvelously simple remedy, namely, removal of the duty on iron ore.

Brokerage houses in their news letters, bulletins, and other pabulum for the instruction or mystification of intending investors continue to refer to Nevada Consolidated's 40,000,000 tons of ore. Now Nevada Consolidated once had about that amount of ore, but during four years of operation it has extracted a fair proportion of it. The gangue has gone to the tailings pile and the metal is now serving a useful purpose as sheet, wire, etc. Nevada Consolidated is a long way from being a decrepit mine but it is no longer a young one. This is apt to be forgotten in the matter of valuation as expounded by brokerage houses.

We do not hear so much about scientific management as a little while ago, but nevertheless the idea has taken a strong hold, in mining among other things, and some very careful study is being devoted to the improvement of efficiency underground. The results that have been acheived in some cases that have been brought to our attention indicate that the seed recently planted is going to develop into an economic progress that will be worth while.

Correspondence and Discussion

A New Filter Frame

In the JOURNAL of June 3, we note that G. W. Shepherd, of the Butters Filter Company, makes some critical remarks on vacuum-filter frames as used in Western Australia, and described by us in an article published in the monthly *Journal* of the Chamber of Mines of Western Australia for February, 1911. We would draw attention to the fact that this article was entitled, "The Vacuum Filter Process in Western Australia," and that your reprint of May 20 was an abstract only of a part of this article.

We would advise Mr. Shepherd to read our complete article as published, before venturing to criticize Western Australian methods; when he has done this, he will probably have a better idea of what local problems have had to be solved in the introduction of the vacuum-filter process here.

It was never our intention to describe the filter frame which we have illustrated, as "new," although it has, we believe, some novel features. This special frame was at first certainly designed for the handling of granular material, but it has since been found to give good results on the stickiest slime. Any engineer who has visited Western Australia is aware that on no goldfield in the world is there a greater variety of ores and treatment processes to be found. No slime, more sticky or tenacious, exists than that treated in some of our plants. We have yet to be convinced that the stickiest slime forms cracks the most readily.

Vacuum-filter frames are all much the same, be they christened Butters, Moore, Cassel, Crush or any other name, but they should be designed to suit local conditions and the material treated. While the so called Butters leaf is doubtless doing excellent work in Mexico and elsewhere, it is totally unsuited for most Western Australian slimes, in the treatment of which thick cakes are required to be discharged by the use of compressed air only. The cast-iron shoes which received so much criticism are an undoubted advantage, as before they were introduced the ends of the beams wore rapidly owing to the weight of the cakes. It may be mentioned that many plants are at work continuously with cakes more than 2½ in. thick; the exposed iron is of no detriment if protected with paint.

Before the introduction of the vacuum process here, a high standard of washing was set by the filter presses, and this has been easily maintained by the vacuum filters. It is certain, therefore, that no channels of least resistance are ever allowed to form.

Views, Suggestions and Experiences of Readers

At the present time more than 90,000 tons of slime are treated in this state monthly, by filter frames such as we have described. Not a single frame has been supplied by the Butters' company, although efforts have been made to introduce them. This needs no comment.

We think that the majority of metallurgical engineers will prefer to design their plants to suit their own requirements instead of purchasing the ready-made article and paying a royalty for the use of patents of doubtful validity.

S. B. Stevens,
W. R. Degenhard.

Kalgoorlie, W. A., July 21, 1911.

A Method of Filing Notes

Many suggestions have been offered on the subject of filing notes, and various methods have been proposed, from elaborate classification and the splitting of sheets, to the binding of publications entire. The question is still open for debate, but the following notes are offered in the hope that they may serve as a guide or furnish a hint to those who have not as yet adopted some system of filing clippings and articles from the technical publications that they may wish to save for reference.

The important question is: How elaborate do I wish to make my index? Each one must decide this for himself. Where one is specializing in some work, subjects of this nature may be carefully classified and subdivided, while for other subjects one general heading may suffice. For example, "Ore Dressing" may be divided into Crushing, Sorting, Milling, and these may be subdivided into Gold Ores, Copper Ores, Lead Ores, or all articles on crushing, sorting and milling of ores may be filed under the one head.

For the filing, manila folders, 9x12 inches, are used, together with a card index of any convenient size. If desired, the card index may be omitted, as explained later. These folders are preferably "third cut," that is, the tab extends one-third the length of the folder. This size will hold any of the technical journals, though those of the size of the *Engineering News* will need to have most of the margin trimmed.

The difficulty of having two or more articles on one sheet is overcome in this way: Where an article ends and another begins on the same sheet, file and index the second article with its remaining sheets under its proper heading. Then on the bottom of the last sheet of the first article, which has been duly filed, write: "Finished on ....." (giving index and number of the new article). Thus, "Finished on Smelting 12," when written at the bottom of the last sheet of an article filed under "Milling," means that the rest of the article on milling is to be found on the sheet filed under "Smelting 12." If more than one article appears on the sheet, it is better to file them all under the heading of the article ending on the sheet and index the others under their respective heads with the reference to this article.

Articles such as those under "Details of Practical Mining," because of their number, present greater difficulties. The sheets, as they appear, may all be filed under the one heading and the names of the articles written on the index cards one after the other. If preferred, they may be cross indexed under the appropriate headings and followed by the notation—"Details of Practical Mining ....25," or whatever number the article happens to bear.

As noted above, the card index may be dispensed with and the titles of the articles written on the outside of the folder in the order of their filing. Later instalments of continued articles may be easily filed in their proper place when once the first instalment has been indexed.

Care must be taken to file sheets in the order of their indexing, and to replace them correctly in the folders when taken out; otherwise it will take much hunting around to find them; to be of use as a reference an article must be readily found when wanted.

ROBERT S. LEWIS.

Stanford University, Palo Alto, Cal., Aug. 19, 1911.

[There are many methods of filing notes, and everyone who indulges in this luxury or conforms to this necessity, as the case may be, will probably develop a system of his own, best meeting his individual requirements. A common difficulty is the treatment of the pages of a journal that contains two articles that ought to be filed in different places. This difficulty is very easily overcome by subscribing for two copies of the ENGINEERING AND MINING JOURNAL, assuming that the file be mining and metallurgical. In the long run this will be cheaper than the engagement in a lot of clerical work.—EDITOR.]

July Operations at Goldfield Consolidated

During July, 1911, the total production of the Goldfield Consolidated Mines Company was 29,253 tons, containing $848,429, or an average of $29 per ton, of which 29,174 tons were milled with an average extraction of 94.55 per cent. Seventy-nine tons were shipped and contained an average of $46.80 per ton. The total net recovery was $27.42 per ton, and total net profit was $582,021, or $19.89 per ton.

JULY COSTS AT GOLDFIELD CONSOLIDATED

Mining:		
Development	$0.97	
Stoping	2.46	
		$3.43
Transportation		0.07
Milling		2.27
Marketing		1.12
General expense		0.33
Bullion tax		0.31
Marketing ore shipped		0.03
Construction		0.10
Total cost of operation		$7.66
Miscellaneous earnings		0.13
Net cost per ton		$7.53

During the month 4078 ft. of development work were done. At the Combination mine ore of good grade was found on the third level about 300 ft. north of the shaft. This, Supt. J. F. Thorn considers the downward extension of the 136 orebody on the second level. In the Mohawk mine the 163 and 155 drifts on the 150-ft. level were extended 100 ft. and produced 400 tons of $20 ore. The 354 sill was extended on the hanging-wall side, producing 245 tons of $58 ore; the 490 intermediate below the 450-ft. level produced 161 tons of $30 ore, this orebody probably being the downward extension of the north end of the 354 orebody; the 499 was extended about 50 ft., producing 150 tons of $13 ore.

At the Clermont the 408 sill was extended along the 413 intermediate and produced 1576 tons of $53 ore. The 306 north on the 600-ft. level was extended, producing 870 tons of $12 ore. In the Laguna the 303 east raise from the 600-ft. north drift of the Clermont produced 122 tons of $20 ore and the 329 intermediate produced 377 tons of $12 ore. The Jumbo produced 365 tons, averaging $14, and the indications are that this mine will produce a large tonnage of $15 ore.

California Quicksilver Production

The production of quicksilver in California in 1910 was 17,211 flasks, valued at $800,484, an increase of 1133 flasks over the output for 1909, according to figures compiled by H. D. McCaskey, of the U. S. Geological Survey. In 1910 California furnished 83.5 per cent. of the total production of the United States, against 76 per cent. in 1909. Until the beginning of the Texas production, in 1899, California had furnished practically the entire output of quicksilver in this country since the first activity in 1850.

The county leading in production is San Benito, in which are the New Idria mines, at present the most important producers in the American hemisphere. Following this is Santa Clara county, with the Guadalupe and New Almaden mines, the latter the most famous quicksilver mine and the one having the largest total output to date in America. There were 15 quicksilver mines in California contributing to the output in 1910. The total production of quicksilver in California from 1850 to the end of 1910 was 2,124,508 flasks of 75 pounds each.

Blast Furnace Smelting with Oil

By E. Jacobs*

Thomas Kiddie, of Vancouver, B. C., a metallurgist well known in the Northwest, recently conducted another demonstration of smelting copper ore in the blast furnace with oil as fuel. The demonstration, like others that preceded it, was made at the works at Van Anda, Texada island, B. C. In a report to his principals, the directors of the Dominion Oil Smelting Company, Ltd., Vancouver, Mr. Kiddie wrote in part:

"The mixture consisted of Boundary District ore, iron ore as a flux, and copper slag from a previous operation. The furnace was started at 11 a.m., using two burners until it became sufficiently heated when two more were started. Everything went along satisfactorily and slag began to flow at noon. The slag was hot and increased in quantity until it ran a pot of slag per minute up to 2:30 p.m., during which time it smelted without trouble or interruption.

"Allowing one hour for the heating up of the furnace, a conservative allowance, we used 157 gal. of oil in 2.33 hours, and 60 gal. for heating up the furnace, or 217 gal. in all. This gives an average of 14.6 gal. of oil per ton of material smelted, equal to 43.8c. per ton of ore. The rate of smelting was 110 tons per 24 hours, an increase of more than 100 per cent. over the results obtained during the best previous demonstration.

"I have no hesitation in saying that these conditions can be improved upon after certain changes shall have been carried out, so that full advantage may be taken of better and more complete combustion of the oil, when the cost of oil consumed per ton of material smelted should approximate 30 to 35c. per ton of ore. The saving of labor costs at the furnace I estimate at 9c. per ton of ore. As a result of this and previous demonstrations, I strongly recommend that the blast furnace be remodeled along the lines already submitted by me to your company, and indorsed by at least two metallurgists of the highest standing in British Columbia." The company has decided to at once proceed to remodel the furnace, as recommended by Mr. Kiddie.

*P. O. Box 645, Victoria, B. C.

Mining Regulations in Norway

By Axel O. Ihlseng*

Some time since I made an examination of the zinc mines of Norway with a view to opening up the mines at Konnerudkollen, which, at that time, had not been operated for 50 years or more. The possibilities of this property seemed so flattering that I investigated the conditions under which mining rights were acquired and under what conditions mining was permitted in Norway. I found many excellent conditions which it would be well for this country to adopt for the sake of the mining industry. Norway certainly presents a fertile field for mining developments with an exceedingly good prospect of success.

Prospectors' Rights Protected

The conditions under which mining is fostered and the facilities offered to prospectors in their quest for mineral wealth are interesting and peculiar to Norway. No such facility is offered in that country to the claim-jumper as the United States affords. No specious claim of prior discovery is possible; no holdups by fictitious claimants, as is so common in the West; no opportunity for the location of fractions, the cause of so much litigation in Montana as well as in other Western States. The prospector in Norway has first right to all the territory about him until he has refused to accept the adjoining land or claim after being notified of his privilege to take it in preference to another locator. No rush of prospectors can surround a discovery in a way to prevent the discoverer from gaining the full fruits of his discovery. Might makes right in the West, but right makes might in Norway.

Mining is carried on under the general law of July 14, 1842, the first six chapters of which cover the conditions under which mining operations shall be conducted. Any person may prospect for mineral on either public or private domain. Prospecting upon private domain must be done under certain restrictions. It cannot be carried on upon the cultivated part or upon places within 100 *alen*[1] of houses or barns without the owner's consent. Prospecting on highways is prohibited. The usual conditions are provided to prevent damage to property by the prospector.

On application to the mining agent of the district, a government official charged

*Mining engineer, Joplin, Mo.

[1]*Alen* = 63 centimeters.

with control of the mines in his district, a prospector's permit, *skjaerpnings-seddel*, is issued, good for one year. On the discovery of mineral or indications the prospector may obtain a mining privilege by making a report to the authorized mining agent of the district. This report must state in terms the situation of the discovery, kind of mineral, whether on public or private domain, and such other facts as to make a full report. The claim made for this mining privilege is published in the nearest newspaper to the claim. This privilege or right is good for 18 months from the filing of the report. It gives exclusive right to prospect within a certain limit, which is stipulated so as to allow the discoverer to locate his claim properly after development. In any case of prospecting or mining when done on private property, the owner of the land has the privilege of becoming a partner to the extent of one-tenth, but must pay his proportionate share of the expenses. He receives no royalty or gratuity.

At any time before the expiration of the mining privilege of 18 months, the locator may apply for a mining license to mine certain claims. A claim is about 100 meters square. The prospector applies for an order for survey, *udmall*. After the survey is made, the reports filed and the notices published in the newspapers as required, the mining agent issues the mining license, which is renewable annually on the payment of a small fee. These *fristbevilgninger*, as they are called, preserve the rights to mine from year to year. Work of mining is supposed to be carried on continuously, but the law especially provides for a stoppage of work during three winter months. The superintendent of mines or mining agent of the district can, at his discretion, after examining the mine and the reasons for a shutdown of the work, grant an extension, which is good for one year and six weeks. These extensions are granted for the general causes of delay usual to mining, inability to sell the ore, or even to tide over financial difficulties of the company operating the property. The request for extension is granted usually without further inquiry.

Owner Has First Right to Adjacent Claims

No person is permitted to locate a claim alongside of one already entered, until the owner of the original claim is notified and given three months in which to decide whether he prefers to lay claim to the new location. When he fails to answer or refuses to accept his opportunity, and not until then, the second locator may enter.

The claim or mining license having been issued, the owner can transfer the same by an assignment of the various documents issued by the mining agent, the claim notices, license, extended-protection permit and the survey papers giving a description of the property conveyed. These should be recorded with the mining agent at his office, and a deed made for the real estate included in the transfer.

If the purchaser is a Norwegian citizen no further action is necessary, but in the case of a foreigner it is necessary to secure a royal permit. This is issued by the government on request and is never refused. This situation applies to incorporated companies as well. If a noncitizen purchases a mine and is a nonresident, he must appoint a resident representative, or attorney in fact, to represent him in all matters before the mining officers and the courts. Incorporated companies having all their offices outside of Norway must appoint a legal representative as in the case of individuals. If a company has a branch office in Norway it must incorporate under Norwegian laws. In the case of Norwegian companies the directors need not be Norwegians, but may be foreigners resident in Norway. The government decides whether a branch office of a foreign corporation is to be so considered, taking the authority of the principal officer only into account.

The law provides a means of condemning real property necessary for mining operations, in the way of shaft house, buildings, stores, machinery, etc. It does not provide, however, for the taking of ground for loading and unloading places and for wharves, nor does it provide for tramways. The courts have fully decided that mining rights cannot be mortgaged. This can only be overcome by a transfer of the property, as in the case of a sale.

The government laws covering mines compel the owners to provide for accident insurance for the workmen, and for the proper regulation of the plant under the factory laws. The poor fund also provides that the mine operators shall deposit a fund to indemnify the general poor office in case the mine should close and the miners should become a public charge. This fund is fixed by a representative from the mine and one from the municipal authorities, the distribution of the fund also being mutual. The mine may also provide its own school for the district, and be exempted from the municipal school tax.

Quicksilver Outlook in Nevada

The production of quicksilver in Nevada in 1910 was 70 flasks, valued at $3256. Although this was a decrease from the output for 1909, as pointed out by H. D. McCaskey, of the U. S. Geological Survey, it was due to suspension of operations at the Shoshone mines, the largest operators, pending erection of a furnace, as the escaping fumes from the retorts used caused serious salivation of the workmen. There are several other quicksilver properties under development in Nevada and increased production may be expected.

Mining in San Juan County, Colorado

By Warren C. Prosser*

At various times during the last few weeks there have emanated from Colorado reports that, owing to the results of tests on the cyaniding of certain ores, and on the application of the static-separation process on certain other ores, the present mining situation in San Juan county is brighter than for several years. In this connection it is interesting to note that the main problem which confronts the mining industry in San Juan county at this time is the treatment of two classes of ore: (1), Cyaniding ores; (2), zinc-bearing sulphide ores. The cyaniding ores are of three classes and occur in as many areas.

The Bear Creek and Eastern Areas

The main development in Bear Creek area, which contains about four square miles, has been done on the Goldbug and Kankakee mines, whose ores are tellurides of gold and silver. At these mines the higher-grade ore is shipped crude, but the lower grade, or that under $20 per ton, is not now profitable.

The Eastern Range area contains approximately 30 sq.m., and the main development in this section has been done in the following mines: Old Abe, Buffalo Boy, Anti Periodic, Slide, Big Ben, Ridgeway, Intersection, Empire and Mascot, Aggie, Victor Hugo, Little Maud, Gold Nugget, Esmeralda, Kittemac, O. K., Peerless San Juan and Mountain Eagle. The veins strike from north 40 deg. west to north 35 deg. east, are composed of white quartz and contain free gold, associated with silver glance and iron pyrite. Base ores occur in the east and west veins crossing these.

Cyaniding Is Tried

The history of the mines in this section shows that their initial development was encouraged by rich outcropping or float. Some rich shipments have been made, but hand work, together with high packing, freight and treatment charges, has rendered even $20 ores, as a rule, unprofitable. As a result of experimental tests conducted by the Intersection mine at a five-stamp mill, and carried on for a little over a year, it has been reported that this class of ore is amenable to treatment by amalgamation and cyanidation. While this mine took the initiative in this experimental work, others, including the Buffalo Boy, have conducted similar tests, and in several cases an ex-

*Silverton, Colo.

traction of over 90 per cent. has been secured. It has also been shown that there are occasional occurrences of bonanza ores on several of the properties. In the veins containing the cyaniding ores of this section, no detrimental factors have yet been found that affect this treatment.

Mineral Creek Section

This area is situated on the dividing range between San Juan and San Miguel counties, and contains about 20 sq.m. Development here is little more than surficial, but cyanide tests conducted during the last year have returned an extraction of 92 per cent. of the gold and 66 per cent. of the silver.

For the treatment of the ores from these three areas, plans are underway at present for the erection of a large cyanide plant, either at Silverton or Howardsville, and it is stated that the money necessary for the fulfilment of these plans is assured.

Zinc Ores

The zinc-bearing ores are scattered indiscriminately over the county, and almost every deposit of base metal is associated with more or less zinc. While the latter occurs occasionally as "black jack" or marmatite, it is usually found in the form of sphalerite. For many years zinc has been detrimental to the ores of San Juan county, as its presence in amounts above 10 per cent. has been penalized by the smelteries. Statistics have been collected which show that there are at least 50 properties which have from 10 to 15 per cent. zinc in their crude ores, and it is significant that the most of these properties are idle.

During the last few years attempts at milling these ores have been successful; one mill has been making a 45 per cent. zinc product and a 65 per cent. lead product. This ore is comparatively free from iron and copper, and good results are obtained by separating on Wilfley tables. Some of these ores contain iron and copper sulphides, associated with the zinc and lead, and the problem of their separation has been solved by tests on electrostatic machines. The district has recently been inspected by representatives of zinc companies, and it has been stated that one of the latter will enter the field soon.

Future Outlook

It is believed that the cyanide treatment will make profitable those silicious ores which heretofore it has been impracticable to treat at the smelteries; that the proposed treatment for the zinc ores will eliminate the undesirable zinc from the smeltery product, besides making a profitable zinc product. With a possible solution in sight for the treatment of these two classes of ores, it is thought that the future for the San Juan district offers more of a basis for hope than might otherwise be supposed.

Mine Rescue Work

With the rapid development of mine-rescue work in the United States in the last two years and the increasing use of the mine-breathing apparatus, there has come to the U. S. Bureau of Mines a demand for information concerning this apparatus and how it should be properly used. In response the bureau has issued Miners' Circular 4, on "The Use and Care of Mine-Rescue Breathing Apparatus," by James W. Paul, who has general charge of the rescue work. Mr. Paul makes the statement that the use of such apparatus for rescue work in mines is no longer an experiment, but has become an important factor in lessening loss of life and property from fires and explosions. The circular describes the various types of apparatus used by the bureau and gives careful instruction as to the care this apparatus should receive when not in use. Then the author passes upon the qualifications of rescue men at the mines. Mr. Paul says:

Mine men, 22 to 45 years old, in good physical condition, who are temperate in their habits and naturally calm and deliberate, are best suited for mine-rescue work. Before a man undergoes training in the use of breathing apparatus he should be examined by a physician, to ascertain his physical condition, especially the action of his heart and lungs and any defects of the nose and throat. Unless a man has a physician's certificate stating that his physical condition is good, he should not be permitted to take rescue training nor to attempt rescue work in a mine.

Rules for Rescue Parties

A rescue party should have not less than five, and better, not less than six members. Only such persons should be allowed to join the party as have already been trained in the use of the apparatus and are equipped with rescue apparatus in good order and have agreed to follow the directions of the leader, who must have full charge. While working in unbreathable gases within a mine the men should keep close to one another and not separate under any condition.

To be efficient and successful, a party must take every precaution for its own safety. If one person in a party faints or receives an injury, he becomes a burden instead of a help, for the entire party must at once conduct him to the surface or to fresh air. One or two stretchers should always be at hand. A relief station or base of operations should be established at the end of the good air and a relief crew with knapsacks should be stationed there ready to put on their apparatus and start at a moment's notice. A patrol of all brattice and doors leading up to the relief station should be maintained to protect the relief crew from harm.

At each large mine there should be at least four crews, two outside and two inside crews, each of six men, including a captain and a lieutenant, and these crews should have practice once a week. While working in dense smoke the members of a crew should hold a rope which leads to fresh air. In case of total failure of an apparatus to supply breathable air, the wearer of the apparatus can throw away all parts but the oxygen cylinder, and breathe from the cylinder through his mouth while endeavoring to reach fresh air with the rest of the crew.

Apparatus for giving oxygen to one who has been overcome with gases is an essential part of the equipment of a rescue party. A telephone helmet is a convenience for shaft work, and its presence lends much confidence to a rescue party. Electric lamps, safety lamps, gas-analysis apparatus, thermometers, a pocket compass, and a map of the mine are necessary parts of the equipment. At each training station a record should be kept, showing the work done by the men and the difficulties encountered. A record of each apparatus should be kept also. If an apparatus fails to give proper service it should be subjected to the regular tests, unless some injury is seen by inspection.

Government Training Course

The U. S. Bureau of Mines has established a regular course of training in the use of mine-rescue breathing apparatus. This training is designed to give miners or other persons connected with mining a knowledge of breathing apparatus in general, and a confident familiarity with those types of apparatus that are most apt to be used in this country.

The purpose of the Bureau of Mines in establishing this system of training is to facilitate investigative work within mines in which disasters have occurred, and to make mine owners and miners acquainted with the value of breathing apparatus for rescue operations after mine disasters. It is hoped that, as a result of this work by the Government, in the near future, men familiar with such apparatus will be scattered throughout the coal-mining centers of the country, and be available on short notice to assist in rescue operations. After a disaster, valuable time is often lost in training men at the mine before rescue parties can be organized. Furthermore, a man cannot work efficiently unless he has thorough confidence in the apparatus. To give a man this confidence, the course of training has been planned in such a way that he must do work in poisonous or unbreathable gases for periods of one and two hours at a time.

Osmium is a hard, brittle, bluish-gray metal, usually occurring with iridium, of a specific gravity of about 22.48. Its only use is in incandescent lamps.

Details of Practical Mining

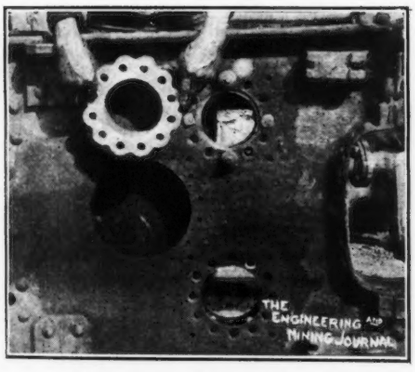
This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent to telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

Cast Iron Tuyeres

BY BANCROFT GORE*

At the copper smeltery of the Compañia Minera de Gatico, Chile, the customary thimbles beaded over the inner wall of the jacket proved troublesome owing to the seepage of jacket water between them and the jacket plates. The furnace had to be blown out on several occasions to expand these thimbles and to calk the leaks between them and the jacket walls. Whenever a leak occurred



CAST-IRON TUYERE BLOCK

on the fire side, unless the furnace was blown out at once and the beading calked, the corrosive action of the sea water used in the jackets was such that the plate in the region of the seepage became thin, making further repairs impossible and a change of jacket imperative. These leaks generally appeared three or four months after the installation of a new jacket, and in spite of repeated calking, with incidental interruption to all smelting operations, the life of a jacket was short owing to defective tuyere construction.

As facilities were not on hand for welding the thimbles to the jacket walls, cast-iron rings riveted to the jacket plates were adopted in spite of the usually accepted theory that the fire wall of a blast furnace is no place for rivet heads, and that the rapid driving of the furnace, and the corrosive nature of a free-flowing slag would lead to worse difficulties at the tuyeres than had been experienced from the use of the discarded thimbles. The furnace smelts from 4.6 to 5 metric tons per square foot of hearth area per 24 hours, and the cast-iron tuyeres have proved superior under the conditions present at this plant.

The illustration shows one of the cast-iron rings about to be placed in the large handhole of the jacket. The ring for the tuyere near the upper side of the jacket has been inserted and is held in place by temporary bolts ready for the riveting operation. The rivet holes on both jacket plates were countersunk and special care taken on fire side to avoid rivet heads projecting above the surface of the plate. Each jacket was tested to 30 lb. hydraulic pressure, and in February, 1909, the furnace, equipped with these jackets, was blown in.

During nearly two years of service there has been no seepage at the tuyeres from either wall of the jackets, and after an inspection made recently during the New Year's feast days, when the bed of the furnace was removed, the rivet heads on the fire side of the jackets were found to be in as good condition as when first installed, and what was formerly the weakest point of the jacket was judged to be the most permanent and indestructible part of the furnace. The massive nature of the rings is especially advantageous where furnace men are inclined to be careless in the use of bar and sledge at the tuyeres.

*Smelter superintendent, Gatico, Chile.

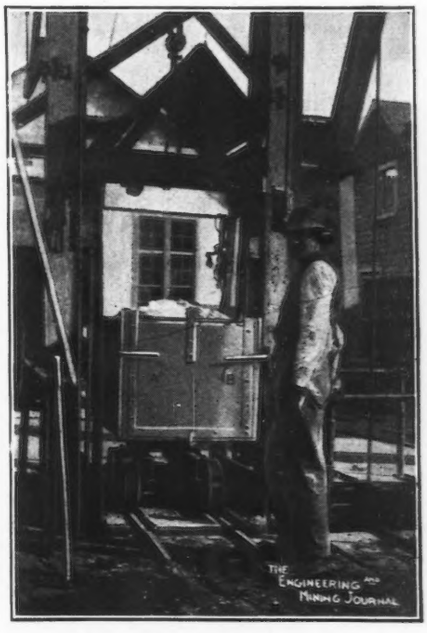
Obtaining Cheap Stope Filling

A unique and satisfactory method of obtaining cheap waste for stope-filling purposes is being used on one of the lower levels of the Tramway mine, at Butte, Mont. It is on somewhat the same principle as the glory-hole method. Three crosscuts, converging like fingers on an open hand, were driven into the granite country rock for distances of 100 ft. or more, and chutes, for drawing the waste out into mine cars, were spaced along the crosscuts at regular intervals. The first floors over the crosscuts were then stoped out, after which the ground was allowed to cave, and as fast as the rock came down it was drawn out into cars. Filling to the amount of 30,000 mine cars has been taken out in this fashion at a low cost.

Car Latch for Hoisting Cages

BY CLAUDE T. RICE

Many hoisting accidents are due to the car catching on the timbers of the shaft, owing to the car not having been latched in place when put on the cage. Different ways of fastening the cars are in use, but the one illustrated and in use at several of the shafts at Goldfield and Tonopah is simple and has been found reliable.



LATCH FOR CARS ON CAGES

A piece of round iron, an inch in diameter and about 18 in. longer than the length of the car, is bent so as to form two horns about 8 in. long, one at each end of the bar and so that the bar has a hold of about 6 in. on the car when the horns are turned down. One of these bars is fastened on each side of the cage by means of fairly tight collars, so that when the horns are turned up they remain in that position unless the cage is given a considerable jolt. In the illustration *A* and *B* are the horns at the ends of two such bars, each bar having a similar horn at the opposite end of the car. In case the cager forgets to latch the car in place, the bars will drop into place

themselves from the jarring in the shaft; in case only one bar is down the car cannot move. In landing, the topman stands at the compartment with the shaft bar raised, so that while the engineer is dropping the cage on chairs, the topman raises the latching bars and has the car ready to pull off the cage without any delay.

Increasing the Effectiveness of Spitzkasten*

By Beauchamp L. Gardiner

The ore from the Sons of Gwalia mine is mainly schistose in character, and consequently the stamp milling and subsequent fine grinding in pans produce a relatively large percentage of slime (50 per cent.), of which a great portion is colloidal in nature and slow settling. The separation of the sand from the slime at that mine is effected primarily by a row of five small spitzkasten, each 3x3x3 ft. deep; the underflow goes to sand-collecting vats provided with Butters distributers and annular launders, which effect a further separation, while the slimy overflow joins that from the classifiers and is delivered thence to the slime-treatment plant. This product, which is termed slime, is characteristic of the slime at most Western Australia plants and contains nearly all the finely reduced colloids together with a quantity of fine crystalloids or sand. Taken as a whole, it is slow settling, and requires an extensive plant to thicken it sufficiently for economical cyanide treatment. The inflowing stream, which contains the equivalent of 6 to 8 per cent. of dry slime, first delivers to a nest of spitzkasten 30x40 ft. The underflow from these is drawn off through 1-in. nipples (into which wooden plugs with holes bored through them are inserted) and by substituting plugs with larger or smaller bore, as the case may require, it is regulated so as to keep the overflow just running clear. The underflow, which ranges from 14 to 18 per cent. of dry slime, delivers to another nest of spitzkasten 32x24 ft., operated in a manner similar to the first, and the pulp is here thickened to from 23 to 27 per cent. (a clear overflow being maintained), and then it gravitates to two dewatering sumps working on the vacuum-filter principle, where it is finally brought up to from 40 to 45 per cent. The quantity of slime handled ranges from 150 to 200 tons per day.

At the Sons of Gwalia cyanide plant the pulp-thickening process is therefore of some moment and any means to accelerate the rate of settlement would be of great advantage. Experiments have been made along lines which practically mean the creation of additional area in the existing arrangements. This is done by suspending in the pulp, in an inclined position, a number of sheets of corrugated iron and it has been found that these sheets materially increase the rate of settlement, thereby making it possible to obtain a thicker pulp.

Before giving the details, consideration of the following experiments will explain the principle involved: A glass cylinder of slime is set up in a vertical position and the slime allowed to settle; the rate of settlement is 40 mm. per min. The cylinder is again agitated and then placed at an angle of 45 deg. from the vertical, as shown in Fig. 1; the rate of settling is then 180 mm. per min., or 4½ times as fast. The reason for this is quite obvious on close examination, for, on the upper side of the cylinder, a stream of clear water can be seen flowing upward and joining the supernatant clear water above the pulp. Evidently the particles of slime settling in a vertical direction, as indicated by the arrows in Fig. 1, must leave, upon any part of the tube facing downward, a layer of clear water which is immediately displaced upward owing to its lesser density compared with the pulp that moves downward to take the place of the displaced water. The incline sheets of corrugated iron are an application of this principle; wherever there is a surface facing downward, the pulp must settle away from it, leaving the water to be forced up. The corrugations deflect the flow into narrow streams, which break the surface at points and do not disturb the natural settling tendency of the slime.

In Figs. 2 and 3 is shown the manner of suspending the sheet, which experience has proved to be most effective. Three spitzkasten were isolated from the rest, as shown in Fig. 4, and each was provided with inclined sheets. Where possible it is best to set them parallel with the current, so as to impede the flow of pulp to the least extent. In the present case, the sheet in the first spitzkasten had to be set crosswise in order to clear the feed launder, but as the flow is not great in that part, it makes no difference. The top edges of the sheet are set just flush with the surface and by regulating with plugs in the underflow, the pulp level is maintained at from 2 to 3 in. below the surface. Small streams of water flow up each of the corrugations to join the clear water above and the slime tends always to maintain its hydrostatic level—the demarcation of slime and water being a horizontal plane over the whole area—with the sheets of iron projecting through it to a greater or less extent, according as the pulp is high or low. The natural settling area is scarcely interfered with, the small jet of water in breaking through affecting it only to a slight extent, so that there is practically the original settling area plus the total area of the sheets multiplied by the cosine of the angle they make with the

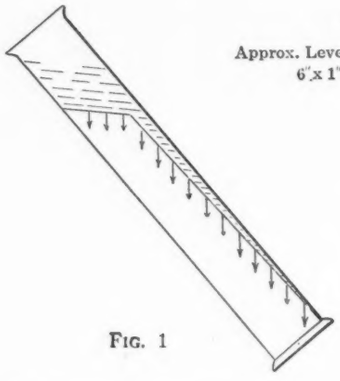
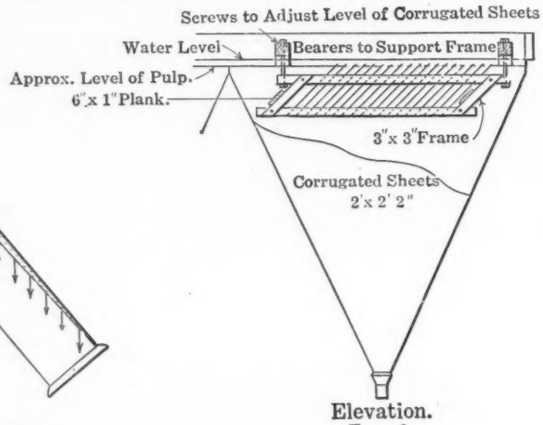
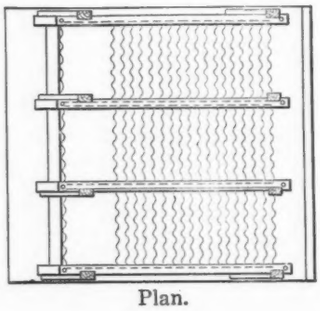


Fig. 1



Elevation.
Fig. 2



Plan.
Fig. 3

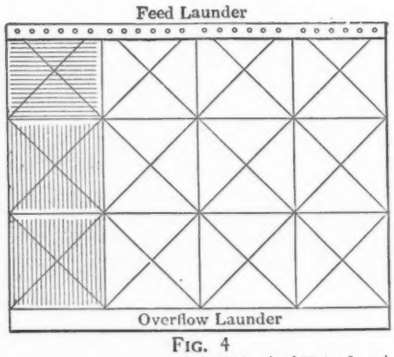


Fig. 4

The Engineering & Mining Journal

Use of Corrugated Plates in Spitzkasten

*Excerpt from an article in the *Monthly Journal* of the chamber of mines of Western Australia, entitled "Slime Settlement."

vertical, or the projection of their area on the horizontal plane.

The figures in the accompanying table show the efficiencies of the ordinary spitzkasten compared with those fitted with the accelerating device. These tests were all made on slime resulting from sulphide ore, the inflowing pulp being from 15 to 18 per cent. of the weight of the ore. The conditions were, that a clear-water overflow had to be maintained and that the pulp level had to be stationary at 2 to 3 in. under the surface and maintained in that position for at least half an hour before any measurements were made. Endeavor was always made to have an amount of pulp proportional to the areas running into each section. The figures in the table were obtained by catching the underflow in a receptacle for a measured time, and by weighing the amount caught; from this and the density, which was also determined, the pounds per minute of dry slime were calculated. The averages show that the feed is nearly proportional to the areas, so that the net result is to increase the thickness of the pulp from

COMPARISON OF SPITZKASTEN WITH AND WITHOUT ACCELERATING DEVICE

No. of Test	Spitzkasten 24x8 ft. = 192 sq. ft., with settling device		Spitzkasten 24x24 ft. = 576 sq. ft., without settling device.	
	Pounds Settled per Minute	Percentage of Dry Slime	Pounds Settled per Minute	Percentage of Dry Slime
1	47.3	42.6	168.0	25.0
2	50.4	40.0	139.3	24.4
3	40.6	40.9	144.3	27.2
4	54.4	41.7	144.5	27.2
5	53.0	40.0	182.0	26.6
Average	49.1	41.1	155.6	26.1

26 to 41 per cent. It is proposed to fit the whole of the nest of spitzkasten with these accelerators and it is expected that the present mechanical dewatering plant will be wholly or partly dispensed with.

The area of the experimental spitzkasten is 192 sq.ft., and the total area of the inclined sheets used is 648 sq.ft.; they are inclined at 45 deg., so that the effective area is 450 sq.ft. Taking the inflow at the average value of 17 per cent. for both columns shown in the accompanying table, and calculating the amount of water removed, then with the figure so obtained divided by the area, the fall in inches per minute can be determined.

For the unaltered spitzkasten the fall is 0.107 in. per min.; for the spitzkasten divided with accelerators the fall is 0.168 in. per min. The increase in the settling rate is not proportional to the increase in effective area. The reason for the difference lies in the fact that, of the sheets dipping some 18 in. into the pulp, the bottom portions are surrounded by a mixture of greater density than the surface layer and consequently there is less settlement per unit area for those portions; moreover, the small uprising streams of water mix again to a certain extent with the pulp, and this tends to decrease the efficiency.

The chief merit of the device is that it can be applied to existing spitzkasten at small cost, and that a given a. ount of settling can be performed in smaller space. It may be used for increasing the thickness of the pulp or enabling larger quantities of pulp to be handled and should be effective if applied to the decantation process, the greater rate of settlement increasing the capacity of the plant considerably.

The principle certainly has its limitations. Depending as it does upon the behavior of the slime and water as two immiscible fluids, its effect is not so marked on thin pulp—the thin seeming to mix more easily than the thick pulp—and the difference in density is not so noticeable. In all cases, the simple laboratory test of the inclined glass cyli der gives a good idea of the possibilities. By determining the settling rate in a vertical position and then inclining at different angles, calculating the increased effective area at the settling rate, a good idea can be formed of the results likely to be obtained on the larger scale.

Oiling Locomotive Flanges

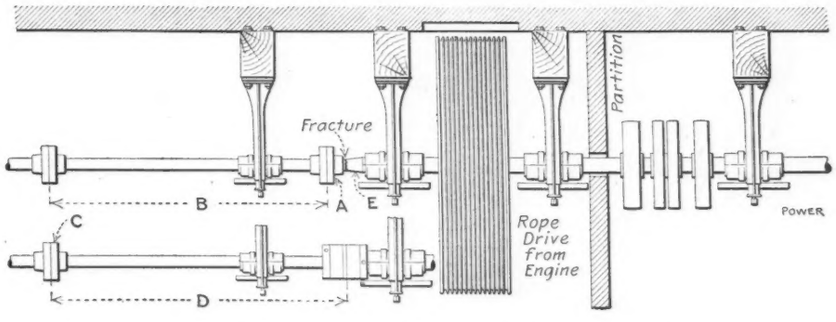
In the course of a paper by O. Stucki on "Achievements in Railroading," read before the Engineers' Society of Western Pennsylvania, the author points out that a train passing a curve slowly makes a squeaking noise, caused by the wheels grinding against the rails, and if the train passes at high speed the grinding action is still there, although one cannot hear the noise. This is destructive practice, as the wheels and rails grind each other, and the locomotive has to furnish the power for it. On the West Side belt tracks in Pittsburg, with their sharp curves, the driving wheel tires suffered greatly until it was found that the life of the tires could be tripled or quadrupled by oiling the flanges. Flange oilers have been tried for years, but without much success until recently, when it was discovered that a heavy asphaltum oil conveyed to the wheel flanges by a jet of steam becomes sticky, so that it can be applied to the flanges without spreading to the tread of the wheel. This road has since equipped many of its engines with this device, and the saving effected in the cost of re-turning the tires, the expense of remounting the wheels, the loss in metal turned off the tread, the loss in revenue during the time the engine is standing in the shop and in longer rail wear, is enormous.

[A mechanical flange oiler was shown in the JOURNAL of Oct. 29, 1910.]

Repairing a Line Shaft

At isolated mills a break down in the line shafting may sometimes mean days of idleness before a new shaft can be obtained. An ingenious mechanic can often make either a permanent repair or so fix the shaft that the mill can be operated until a new part arrives. Robert Bond, in *Power*, describes the method he used in repairing a broken shaft.

The break occurred in the main driving shaft, which twisted off almost flush with the flange coupling *A*, as shown in the accompanying illustration. This shaft was 4½-in. diameter, but had been turned down to 3 in. where it fitted the coupling. To take this shaft out would have meant shutting down the plant for the rest of the week, as the rope drive would have had to come off, as well as taking off the driving pulleys.



BREAK IN THE LINE SHAFT AND THE REPAIRS

The repair job was begun by taking out the section of shaft *B*, on which were two flange couplings and to which the coupling on the broken piece was bolted. The flanges were removed from this shaft, and the flange *C* was then pressed on a longer section of shaft *D*, which came up to the point where the shaft had twisted off.

A compound rest was then taken from a lathe and rigged on a staging alongside the shaft and that part of the tapered shaft at *E* was turned down to a diameter of 3 in. This turning was done during working hours, with the continuation of the shaft in the room to the right of the partition running at full speed, the shaft making 270 r.p.m. A keyseat was cut in the broken shaft with a portable keyseating machine, and the two shafts were then connected by a box coupling, as shown in the lower view.

Oil Refining in California

SPECIAL CORRESPONDENCE

In the early period of competitive struggle between the independent oil producers and the producing and marketing corporations in the California fields, the Standard, not being a producer of crude, was looked upon as being somewhat out of line in the fuel-oil industry; and the wonder was that it could afford to take contracts for such low figures, even with the advantage of railroad rebates. The secret was soon disclosed that the Standard was filling its exceptionally low-price contracts with residuum from the Richmond refinery. In that day the oil-fuel consumers were slow to accept residuum in lieu of the crude product; they had to be educated to take what they could get and while their education did not progress rapidly, the economic advantages both in cost and efficiency of petroluem for fuel purposes have become so completely established that the educational period is passed and there is little question now when contracts are made whether they will be filled with crude or residuum. In thus establishing markets for the fuel oil of the refineries there has been also created a demand for the expansion of the refining industry, and the wonder now is where will this expansion end.

There has recently been an increase in the discovery and development of high-gravity oil-bearing measures in California fields. This, together with the increased demand for gasolene and other light products of the refineries, has been taken as the chief if not the sole cause for the present movement toward expansion of the refining industry. But a close analysis of the situation discloses that the control of the petroleum industry of California lies in the capacity of the marketer to supply all the commercial products of the petroleum fields. In the beginning the Standard, in California, was merely a refiner; then it became a buyer and seller; later it became a producer of crude, and a manufacturer of fuel oil. Had residuum not been introduced in competition with crude for fuel purposes, the present expansion of the refining business would not have been possible.

There are numerous and various reports and rumors of the proposed or contemplated building of new refineries and it is too early to say with certainty how many of them will develop into actuality; but this much is known: the Standard has broken ground and begun construction of its new plant at El Segundo, near Los Angeles, and is adding largely to the capacity of the Richmond plant; the Union has completed its new refining plant at Stewart station, on the Fullerton-Los Angeles pipe line; and the Lost Hills is coming to the fore as a producer of high-gravity oil that will add largely to the State's supply of refining oil.

Whether or not the Cameron-Crocker interests and the Associated, who are the heaviest producers in the Lost Hills, shall decide to refine the product on the ground and whether or not the Royal-Dutch interests will undertake refining at Martinez, will not greatly affect the situation; nor does the reported refusal of the Guaranty Oil Company to exercise its option of purchase of the United Oil Refineries plant at Los Angeles cut a pronounced figure. The fact is being indisputably demonstrated that the largest proportion of California crude petroleum must eventually go through the refining process and that the refiner will in the end control the petroleum industry.

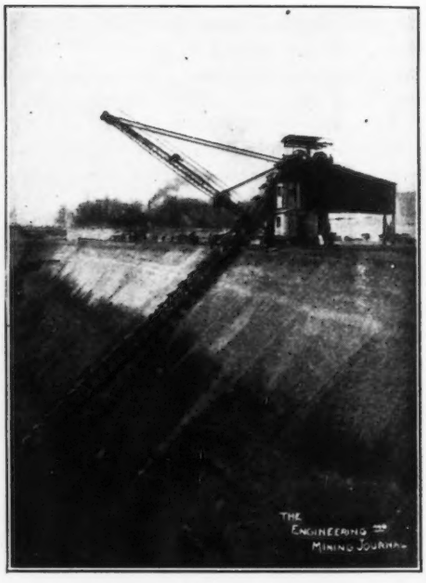
Excavator for a Hungarian Cement Works

An unusual excavator has been installed lately in the clay pit of a cement works in Hungary, and because of its peculiar design and large capacity it is believed to be worthy of note. The clay bed upon which it works is composed of a comparatively light material, which is more or less sandy and moist but not sticky and which lies in sixteen clearly defined horizontal layers, the upper ones of which are richer than the lower. Manual labor was employed throughout for a number of years but lately it was determined to substitute mechanical methods. In order to keep the plant supplied with a material of uniform nature, it was necessary to extract it from all the beds, which have a thickness of 66 ft., in a single clean cut instead of by working at different levels. In order to accomplish this it was necessary to use an excavator of large dimensions and of a design somewhat different from the ordinary type. The one that was finally installed was designed and supplied by the firm of Adolf Bleichert & Co., of London and Leipsic.

The machine works at a distance of 1315 ft. from the engine house and along a track 920 ft. in length; the extracted material is transferred from two drop chutes into a chain railway for conveyance to the mill. Since the material is to be kept uniformly mixed, the bucket chain can only be shifted parallel to itself and the cut of the excavator is taken in a straight line.

The frame is designed in rolled sections and strong plates and is well stiffened by cross and diagonal bracings. The excavator-bucket chain is driven by an alternating-current motor of 75 h.p. The movements of the bucket chain, the traveling of the excavator and the raising and lowering of the bucket guide are quite independent of one another, and can therefore be actuated either simultaneously or successively. The buckets are made in one piece from flat steel plates, bent into shape and discharging to the rear; a knife is screwed on to the blade side, and can be easily sharpened or exchanged. The material is dumped from the excavator shovel into the loading pocket, from which it is drawn off into the railway car.

Some of the details showing the unusual size of the machine are of interest. The working angle of the guide is 47½ deg. and the track upon which it runs is horizontal and has a gage of 10 ft.; the distance from the center of the traveling track to the center of the chain railway is about 14 ft. The projection of the counterweight is about 50 ft., and the counterweight itself, which consists of paving stone, weighs 40 tons. The bucket guide has a length of 125 ft. with a dredging depth of about 65 ft. Pendulum feet are fitted on to the rear side of the counterweight, coming to rest when the excavator guide is released at any time; in this manner they carry the main part of the counterweight.



EXCAVATOR MAKING 66-FT. CUT

Gold Mines in Nova Scotia

SPECIAL CORRESPONDENCE

During the last three years development work has been going on continuously at the Holman mine in the Caribou district of Nova Scotia and the results are satisfactory. The first work was started in August, 1908, and the mine is now believed to be on a permanent and profitable basis. Regular shipments of bullion are being maintained and the grade is as high as any that reaches the United States assay office.

Briefly, the gold-bearing vein is a part of an anticlinal fold and development work has been conducted with the purpose of working the vein in both legs of the fold. To accomplish this, a three-

compartment, vertical shaft was sunk directly in the dome of the fold; from this shaft, levels and crosscuts have been driven at depths of 40 and 100 ft. from the surface. Up to the present time no real mining has been done as the ground has not been sufficiently opened; enough ore, however, has been removed in the course of development work to keep a 10-stamp mill running continuously for more than a year and at a good profit for the last six months of this period.

A painstaking study of the geology of the gold districts of Nova Scotia, covering a term of about four years, seems to indicate that this district has either been neglected or has been abused by exploitations, the latter conducted largely by promoters. It is believed that if a small portion of the money that is now being poured into Porcupine were expended judiciously and honestly by practical mining men in Nova Scotia, some notable gold mines would result in the latter district.

Tramming in the Transvaal

By Frederick H. Hatch*

Ore broken in the stopes has, in the past, been trammed on light rails, from the stoping chutes to the loading stations at the shaft, in four-wheeled cars of from 12 to 16 cu.ft. capacity, by hand. While ore was being transported on every level through tortuous and badly graded roads of the customary small dimensions, scarcely any other method was possible. It is true that the late Wager Bradford some few years ago did attempt the introduction, at the Langlaagte Deep, of a monorail system of tramming, which was also tried by E. J. Way at the New Kleinfontein mine. It has not, however, been generally adopted, on account of the expense of installation.

Endless-rope Haulage to Be Installed

Under the changed conditions now prevailing on the Rand, due to the enormously increased size of the properties brought about by recent amalgamations, and the consequent possibility of concentrating a large output on fewer main hoisting shafts than heretofore, the evolution of an entirely new system of underground transport is being accomplished. Thus the Crown mines (late Crown Reef, Crown Deep, Robinson Central Deep, South Rand, Langlaagte Deep, Langlaagte Royal and Paarl Central) are concentrating on two shafts the hoisting done, prior to the amalgamation, through seven shafts. It is becoming recognized that the rock, broken in the stopes, can be economically dealt with only by handling it on a few main-haulage levels, situated at great intervals apart and driven straight, from point to point, in the footwall of the reef. The rock mined above each haulage level, can be delivered through vertical or inclined chutes; should it be necessary to feed the haulage with ore mined below that level, such ore can be raised through inclined roads by mechanical haulage or electric hoists[1]. These main haulage roads can, on account of their economic importance, be constructed of large dimensions. They can also be carefully graded and equipped with heavy rails. Such a system is being carried into effect at the Crown mines, where the two main hoisting shafts are to be connected, at a vertical depth of 2200 ft., by a main-haulage level 14½ ft. wide. This gallery is being driven in the footwall of the reef from one end of the property to the other, and will, when completed, be three miles long. It will be operated by electrically driven, endless-rope haulage, so arranged that the ore may be delivered to either shaft; it is estimated that the two shafts between them will account for from 9000 to 10,000 tons of ore per day. The greatest output of any existing shaft on the Rand today probably does not exceed 2000 tons per day. Other main-haulage levels will be driven, as required, at vertical intervals of 600 ft. Similar work is being done at the New Modderfontein and at the Modder B mine.

Straight Roads Necessary

Endless-rope haulage can be used with advantage only where the roads are straight; where there are many curves it is preferable to haul the trains either by gasolene locomotives, as the Langlaagte Deep, or by electric locomotives, as at the Geduld mine. With the latter system some difficulty is experienced in completely insulating the electric current from the raw and careless native. E. J. Way states that he is experimenting, with considerable success, on a conveyer-belt system of transporting ore. Each section of belt will be driven by a separate motor and will feed on the next section by means of a specially designed chute.

The bold policy of driving these straight haulage roads in the footwall of the reef, before even the orebody has been blocked out, as is being carried into effect on the Crown, New Modderfontein and Modder B mines, is an interesting indication of the confidence of the Rand engineers in the relative permanence of the gold contents of the banket, as compared with quartz veins. The big intervals at which the reef levels are now being driven is another indication of the same confidence. Thus in the New Modderfontein mine the reef levels will be driven at 500 to 600 ft. apart, and the main-haulage levels, in the footwall of the reef, at 1700 to 2000 ft. apart.

Stope Conveyers

The handling of broken rock in the stope is, from an economic point of view, scarcely less important than its haulage on the levels. Everything depends on the angle of dip of the reef. In many of the outcrop mines of the Central Rand the high dip of the reef permitted the rock, broken in the stopes, to find its way by gravitation to the tramming level, where it is drawn off as required from the chutes; but with dips of 25 to 30 deg., as in most of the deep-level mines, the broken rock requires to be assisted down the stope floors by shoveling. Only in the extreme East Rand, where the reef lies flat (8 to 10 deg.) is it possible to fill the cars at the stope faces and to run them thence direct to the tramming levels. Hand shoveling is uneconomical, and, moreover, is detrimental to health on account of the dust it raises. Consequently, several attempts have been made to substitute for it some conveyer system of handling the broken rock. E. J. Way has described a method employed by him at the new Kleinfontein mine.[2] With seventy conveyers in use, Mr. Way employed 420 fewer men in the stopes than when shifting the rock by shoveling. Mr. Way's stopes conveyers are shaking chutes, consisting of iron plates, 18 in. wide and 8 ft. long, the whole chute varying in length, according to the state of development of the stope, from 32 to 224 ft. They are suspended by short chains from the roof next to the working face of the stope, and are operated by one or more men, according to their length, who pull at ropes attached to the upper ends of the conveyers. Kept in motion by the jerks thus transmitted, the ore slides down the conveyers and is discharged at the lower ends into chutes or direct into cars at the tramming level. Being easily dismantled, the conveyers can be taken down before, and put up after, each blast. When the working face has advanced about 6 ft., they are hung in a new position close to the face of the stopes, a series of small holes being drilled in the roof to take the bolts carrying the chains. Many of these shaking chutes are now in use on the Rand and are now mostly hung from a rope stretched taut along the roof. Each chute length is attached by chains, hooked onto clips permanently fastened to the rope at the correct intervals. Before blasting the chutes are unhooked from the rope, which in most cases can be left on the roof. When shifting to a new place, it is necessary only to attach the rope to the roof, by drilling a few holes in line, without having to keep the exact distance of the chute lengths[3].

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Note—Extract from the "James Forrest" lecture, 1911, before the Institution of Civil Engineers, entitled "The Past, Present and Future of the Gold Mining Industry of the Witwatersrand, Transvaal."

[1]Compare "The Kimberley System of Handling Large Quantities of Ground in the Minimum of Time." A paper read by Alpheus Williams at the Kimberley meeting of the South African Institute of Engineers, 1910.

[2]*Proc.* Inst. Mech. Eng., 1907, p. 989.

[3]Tom Johnson, *Journ.* Chem., Met. and Min. Soc., S. A., Vol. X, 1910, p. 282.

Ore Loading Plant, Island of Elba

By C. A. Tupper*

Climatic conditions necessitated strong, light construction, with large capacity and rapidity of operation. Material loaded is iron ore containing from 40 per cent. upward of iron.

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During an inspection made this spring of the iron-smelting works of the Societa Siderurgica di Savona, at Bagnoli, near Naples, Italy, I was told of an interesting ore-loading plant recently erected on the island of Elba, in the Mediterranean, from which this company derives a large part of its supplies; and later I visited the island for the purpose of observing the construction of the plant. From Piombino, on the mainland, to which a spur runs down from the main line of the Rome-Genoa railway, a small boat takes one to Porto Longone or Porto Ferraio on the island, passing the mines on the way, and it requires no great stretch of the imagination to perceive the necessity for such a plant as that illustrated and described herewith.

Unfavorable Weather Conditions

The high, rockbound shores of Italy and Elba are separated only by a narrow strait, through which the wind sweeps with terrific violence during much of the time; and, under the most favorable conditions, there are not more than 150 days in the year when vessels can be loaded on this exposed coast. Formerly the ore was loaded into barges and transferred to vessels anchored in deep water; but with the completion of the new blast furnaces at Bagnoli, the first two of which were started last year, and to insure getting out sufficient supplies in periods of fair weather, it became necessary to devise some rapid, mechanical means of transporting the ore directly from the mines to the steamers.

Producing Mines

The main deposits of iron ore are found on the precipitous east coast, in the mountains lying above Rio Marina. Here lie the spurs of the Pero range, with Mount Calendozio, the craggy sides of which rise almost perpendicularly from the sea, and on its crest are the important Albano deposits, recovered from what are known locally as the Capo Pero, Calendozio, Albano, Pistello, Puppaio, Grattarino, Grotta, Giuncaia, Tarambano and Imbuto mines. To the southwest, near Portello, is Mt. Gigo, which has also been called Giove. The deposit here is worked by two mines, the Zuccoletto and Rosseto and, farther toward Rio Marina, the Sanguinacci, Polveriera, Pozzi, Fondi, Falcacci and Febbriche. The ore is a hard, spathic, brown ironstone, crystalline in its structure and frequently found in a fibrous formation with ocher veins. It is recovered principally in open workings, as illustrated in Fig. 1. At Albano, where this photograph was taken, the pit railways are operated by man and horsepower. The ore runs about 40 per cent. iron, with an output of approximately 800 tons per day. In the Portello district, however, the ore yields an iron content much higher, with a daily production of from 1200 to 1400 tons, and mining locomotives, with trough-tippler trains, are employed.

Various Plans Considered

In planning the construction of an ore-loading plant at each place, it was decided that a capacity of 200 tons per hr. would be essential in order to take full advantage of the favorable weather for loading likely to occur in a year; and as the shallows allow vessels to approach only within 100 to 200 yd. of the coast, the plant would have to be carried for a considerable distance into the open strait. A mole of rigid masonry on which the ore-car tracks could be laid, was out of consideration from the fact that, on such an exposed coast, it would require the strength of a breakwater, with correspondingly heavy expenditure; furthermore, it would have acted as a sand-catcher. This, by extending the shallows within a few years to the extremity of the mole, would defeat the object of the work, as in somewhat similar cases elsewhere.

An alternative was the construction of a ship-loading station in deep water. In spite of the large hourly capacity required, it was possible to connect the mountain side with such a station by means of an aërial ropeway in a single span of from 350 to 650 ft. For this station, an expensive foundation on caissons would have been necessitated.

Fig. 1. Open Workings at Albano, Island of Elba

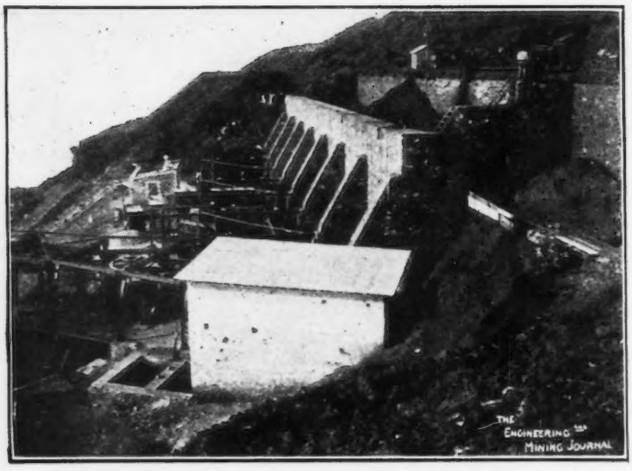


Fig. 2. Ore-loading Station at Albano Mines

Light Pier Decided Upon

It was, therefore, decided to build a loading pier of railroad iron resting on driven piles, such as is customary along the Italian coast. This would afford sufficiently substantial construction and at the same time avoid the piling up of sand.

Consideration was then given to the matter of handling the ore on the pier, whether by means of surface tracks or an aërial line. The former required various intermediate appliances, such as gravity planes, and the automatic return of the empty cars presented difficulties; also, the construction of the pier would have to be heavier and more expensive. Therefore the decision was in favor of a

light pier and an aërial line, in accordance with the plan which had been submitted by Adolf Bleichert & Co., wire-ropeway manufacturers of London, England, and Leipsic, Germany, who were also the constructors and erectors. This project, which was recently completed and is now in full operation, has given a most simple and economical solution of the loading problem. It provided for duplicate systems at Albano and Portello.

Loading at Mines

The ore, as it comes from the mines at each place, is dumped into hoppers from which the aërial buckets are loaded. These hoppers are built of masonry, with inclined floors. A set of 12 with a total length of 167 ft. is provided at Albano, and at Portello there are 24 with a total length of 265 ft. At each point six of the aërial cars can be simultaneously loaded by the manipulation of suitable gates. A view of the loading station is given in Fig. 2. The buckets, which are of one-ton capacity each, are then weighed and registered by automatic scales, a set being situated on each of three parallel branches in the switching section of the suspension-railway terminal at the loading station. The arrangement is clearly shown in Fig. 3. After this the buckets are pushed from the spurs to the main overhead track, where they couple automatically to the continuously moving cable.

Construction of the Aërial Tramway

The aërial trackway consists of steel-wire ropes, securely anchored, on which the bucket carriages run. In Figs. 4 and 5 may be seen the Albano plant from above, with the crossing from the fixed suspension rails to the carrying ropes. It will also be noticed that these ropes are carried to the open track by iron supports. At places where the line has heavy gradients the Bleichert coupling apparatus, known as the "Automat," grips the traction cable with absolute safety. On the shore, as will be seen, several supports are erected between which the carrying ropes are deflected and spanned by means of heavy weights. It is stated that, by this means, overloading of the ropes has been rendered impossible. From Figs. 4 and 5 may also be observed the loaded buckets going down, and the reversed empty buckets returning.

Construction of Pier

In Fig. 6 is illustrated the tension appliance, and this also shows clearly the construction of the pier formed from railway irons, with the arrangement of the supports which carry the fixed suspension rails constituting the continuation of the carrying ropes over the sea. The traction cable is also guided along this section, and it is deflected at the end of the bridge work by means of a suitable sheave. The hight of the suspension line above sea level is 42½ ft.; vessels can be loaded without difficulty at any stage of the tide, which shows considerable rise in the strait. The loading pier has a width of 10 ft., expanding, 100 ft. from the end, to a platform 30 ft. wide.

Upon reaching this point the ore buckets tipple automatically into portable chutes distributing their contents in the vessel. From Fig. 7 it will be seen that the steamers, when being loaded, are anchored or otherwise secured alongside the pier, but do not touch it, so that their movement does not interfere with the process of loading. Fig. 8 gives a close view of this operation. It will be observed that the loading hoppers, of which

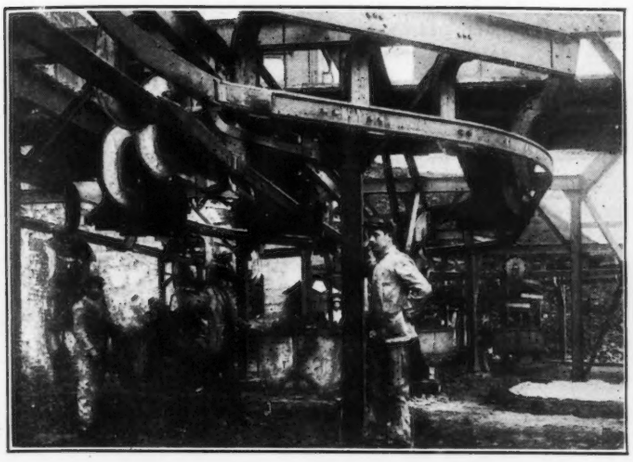


Fig. 3. Automatic Weighing and Recording Apparatus

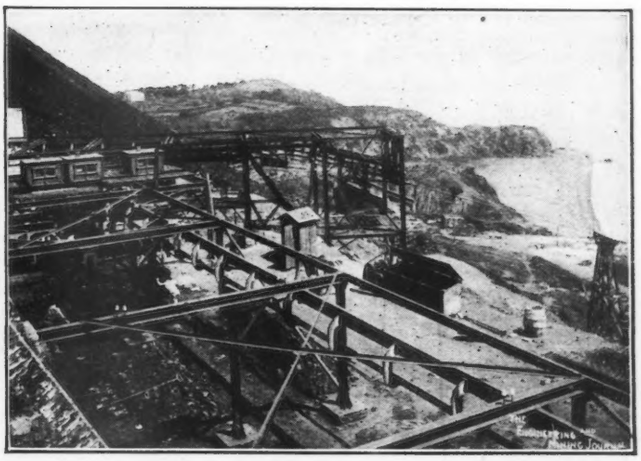


Fig. 4. Beginning of the Aërial Line, Island of Elba

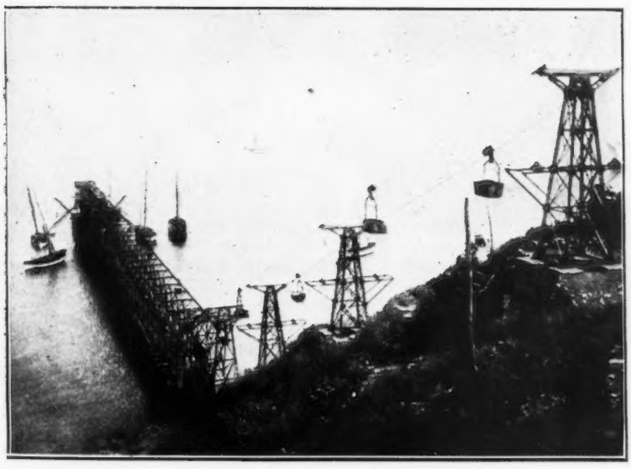


Fig. 5. Aërial Line from Above

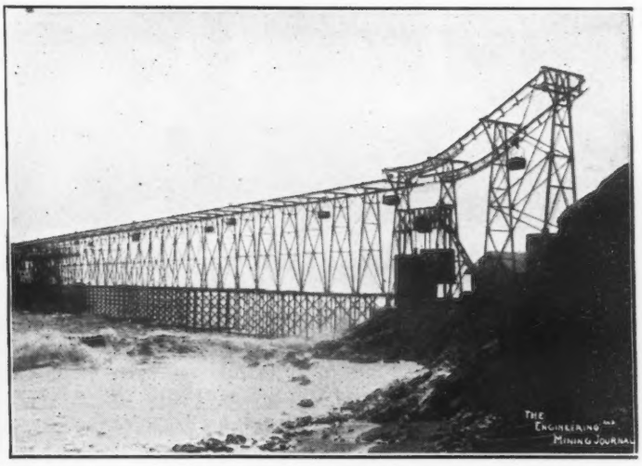


Fig. 6. Showing Tension Weights and Pier

there is one on each side of the pier, run on a trackway, and the chute is raised or lowered by a slewing crane, thus rendering the system unusually flexible. When more than one loading chute is in use the buckets discharge into one or the other as governed by the automatic detent or trip, so that the process is carried on rapidly and without interruption. The passage of the buckets around the return sheave at the extremity of the bridge is also automatically effected without detaching them from the traction cable; the only labor required on the bridge is that of a man to shift the chutes from time to time.

Length and Capacity of Lines

The length of the Albano line is 1000 ft., with a fall of about 160 ft. In each hour there are handled 200 buckets which makes it necessary to despatch them at intervals of 18 seconds; with a speed of the traction cable of 4 ft. per sec., the distance between the buckets is about 70 ft. There are, consequently, always 22 cars on the line and an additional six cars in the station for loading and weighing. The Portello line has a length of 2460 ft., with a fall of 395 ft. The capacity of each of these lines, amounting to 200 tons per hr., is high in European practice, but it has been previously reached on a number of aërial ropeways. Compared with the normal capacities of such plants, which are from 50 to 100 tons per hr., the distance between each two buckets is short, but the time interval of 18 seconds is not the minimum attainable. On a somewhat similar ore-loading line at Vivero, Spain, where 250 tons per hr. are handled, the buckets follow one another at intervals of 14.4 seconds.

It is, however, the judgment of the engineering firm named above, that a further reduction will hardly be feasible. To enlarge the carrying capacity of aërial railways the use of double carriages or the installation of double ropeways is preferable. For these plants on the island of Elba the use of four-wheel bucket carriages for heavier single loads, with a reduced wheel pressure, is proposed for the future, should an increase in carrying capacity become necessary.

Company Supplies Its Own Furnaces and Also Sells Ore

The mines mentioned and the two loading plants, are owned by the Societe Anonima di Miniere e di Alti Forni Elba, which also has its own blast furnaces and steel mills, the headquarters being at Porto Ferraaio on the island and Follonica on the mainland. Besides supplying its own needs, ore is shipped to the smelteries at Piombino and at Bagnoli, it being the large deliveries contracted for by the latter that caused the construction of the new loading plants. Steamers of 3000 to 4000 tons burden are utilized for the shipments to Naples; but the company's own supplies and some of the ore for Piombino are carried in small sailing vessels, as the runs are short.

The company employs about 2000 men in the mines and at its works. The staff at each of the ore-loading plants consists of 25 men, including the hands engaged at the hoppers and weighing appliances and a small gang to assist in warping in and handling the boats at the pier head. Labor is cheap, being recruited from the fishing villages and the peasantry of the island, and more men are required for the same service than would be necessary either in Germany or the United States. An interesting feature of the loading plant at Albano is the fact that the excess power on the downward line, about 30 h.p., which would ordinarily be braked, is utilized to drive a pump for the ore washery, the uniformity in the speed of the line being maintained by an automatic brake regulator. At Portello a brake is used.

A double-carriage bucket system, the plans for which were drawn by the same engineers, has just been decided upon for the new ship-loading ore plant to be built by a French mining company known as the Societe des Mines at Carrieres de Flamanville, which will handle 500 tons per hr., with buckets holding 1½ tons each, operating on a double track. A special feature of the carriage, which distinguishes it from former designs for attaching aërial loads to four wheels, is a coupling apparatus on the order of that used for the Elba stations but which utilizes the entire weight of the bucket and its load for the clipping action. The new plant, when completed, is expected to be one of the most efficient aërial tramways ever built.

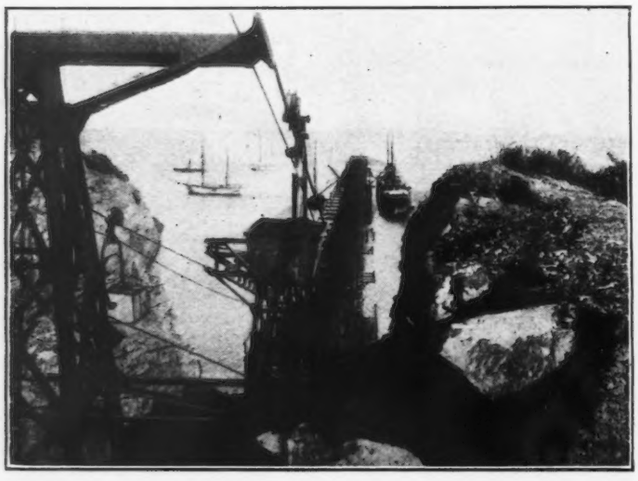


Fig. 7. Steamer Loading at the Pier, Island of Elba

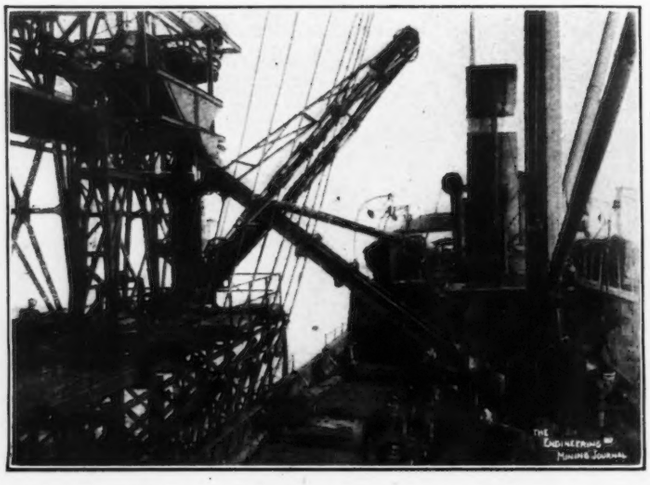


Fig. 8. Close View of Steamer Loading, Showing Swinging Arm

United States Waste Metal Recovery

The recovery of scrap metal in the United States in the year 1910 is shown in an accompanying table, prepared by the U. S. Geological Survey.

On the supposition that the remelted brass contained 70 per cent. of copper, the total recovery was 94,200 tons, of which about 15,500 tons was recovered by the large refiners, the remainder by the scrap-metal dealers. The total recovery was equal to about 17 per cent. of the domestic consumption of new copper.

WASTE METALS RECOVERED

	Tons
Copper, exclusive of that in brass	51,000
Remelted brass	62,000
Remelted lead	29,384
Lead in alloys	25,939
Remelted spelter	41,223
Zinc in alloys	2,709
Tin in bars	7,217
Tin in alloys	6,686
Antimony	2,779

Secondary lead amounts to 11.5 per cent. of the domestic consumption, and secondary zinc to about 23.2 per cent. of the total. In the case of tin, the production is practically negligible in this country, and the scrap recovery is the chief source of domestic supply.

The Cost of Mining in Nicaragua

By Henry B. Kaeding*

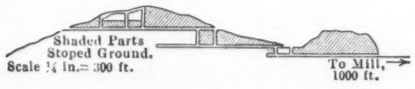
Although the Siempre Viva mine is situated in a remote district of Nicaragua and the costs and difficulties of bringing in supplies are great, the total cost of mining and milling is low.

*General manager, Siempre Viva Mining Company, Nicaragua, C. A.

The Siempre Viva mine in the Pis-pis district of eastern Nicaragua is accessible from Cape Gracias á Dios, a town on the Caribbean sea, by traveling up the Wanks, Wasspuc and Pis-pis rivers. The transportation of supplies is expensive and difficult; labor is scarce and inefficient, and while the country near the mine is healthier than most parts of the district, malaria is prevalent. In spite of these adverse conditions there are redeeming features, so that all things considered mining and milling can be done at low cost, as is shown by the accompanying cost sheets for work done during April and May of this year.

The Mine.

The mine is opened by three adits as shown in the accompanying longitudinal section, on a vein seven feet wide. The vein has, to a certain extent, been stoped above these levels. The portal of No. 1, or the lowest adit, is 1000 ft. from the mill. Ore from the upper levels is trammed through the upper adit and sent down through chutes to the second adit, then trammed to chutes leading to the No. 1 adit, where it is loaded into



The Engineering & Mining Journal

Section of Siempre Viva Vein

one-ton cars and trammed to the mill. This method means that the ore from the surface pillars has to be handled three or four times in order to place it in the mill bin; hence a comparatively high tramming cost. The No. 1 adit is now being extended so that all the ore from the mine can be taken out through that adit only.

The ore is a soft quartz where oxidized; below the transition zone it is hard quartz, containing sulphides of iron, lead and zinc. With regard only to its physical properties, it may be classed as an ore of varying hardness, from medium soft when oxidized to fairly hard when unaltered.

The 20-Stamp Mill and Cyanide Plant

The mill is an antiquated 20-stamp battery, originally of 450-lb. stamps, lately weighted to 650 lb. The mortars are light and sectionalized; the installation is highly unsatisfactory but steps are now being taken toward building a new mill.

The cyanide plant, until March 10, consisted of mechanical agitators which received the sand and slime just as it left the battery after being crushed through a 25-mesh screen; the combined pulp after agitation went to cone classifiers and then to a Hunt filter. On March 10 this system was discarded; the ore was run over amalgamating plates; the sands and slimes were separated and the sands leached in large sand vats. The slimes are now being thrown to waste until such time as a suitable filter plant can be built.

The class of labor available consists of the native, or Spanish-speaking Nicaraguan; the Mosquito Indian, who speaks no Spanish; the Jamaica negro, including the negroids of all the islands and keys on the eastern coast of Nicaragua; and the mongrel mixture of all these races, that delights in calling itself "Creole." This last is about the most worthless of the lot; about the only employment for such men is as amalgamator boys, provided there are a few husky Indians around to do the real work for them; or as oilers at a hoist or motor. The Jamaica negroes are nearly as worthless, the Spanish-speaking Nicaraguan works underground as a miner, trammer or shoveler; the work of the Mosquito Indian is confined principally to outside tramming and shoveling. Taking it all in all, the labor available is about the poorest and most inefficient native labor I have had to do with. The men are ambitionless, weak and lawless; and as a fair comparison I may say that they may be rated approximately as giving about half the labor per man as Mexicans, or about a third or quarter what may be expected from a white man in the North.

For this inefficient class of labor we are called upon to pay to miners, 80c., to shovelers and car men, 70 or 75c., and to outside labor, 50c. per day. In addition, the laborers get their food and lodging, the latter cost being negligible, and the former averaging about 50c. per day. The average wage may be taken at 70c. or $1.20 per day, adding the cost of board. This compares unfavorably with Mexican labor at an average of 90c. per day, for Korean labor at an average

Cost Sheets of the Siempre Viva Mine, Nicaragua, C. A.

Operating Costs for April, 1911—2748 Tons of Ore Treated

	Mining		Extraction		Maintenance		Development	Construction
	Tramming	General	Milling	Cyaniding	Buildings	Machinery	Outside	Slimes Plant
Superintendence	.....	$150.00	$65.00	$50.00	$50.00	$50.00	.....	$190.00
Labor	$361.85	930.30	242.82	137.45	26.46	78.54	51.24	44.10
Supplies	48.80	191.39	141.42	842.30	5.85	90.48	80.00	.....
Kitchen	266.33	664.99	187.73	119.73	19.40	45.40	37.48	27.41
Power	.....	14.78	148.79	.....	.....	.....	.....	.....
Assaying	.....	69.93	6.66	16.65	.....	.....	.....	.....
General expense	.....	211.46	211.46	211.48	42.29	42.29	.....	126.87
Timber and lumber	5.26	223.36	15.42	32.76	171.90	.....	.....	65.38
Surveying	.....	32.50	.....	.....	.....	.....	.....	.....
Totals	$682.24	$2488.71	$1019.30	$1410.37	$315.90	$306.71	$168.72	$453.76
Cost per ton	$0.2483	$0.9056	$0.3666	$0.5136	$0.1149	$0.1116	$0.0650	$0.1651

Operating Costs for May, 1911—2507 Tons of Ore Treated

	Mining		Extraction		Maintenance		Construction	
	Tramming	General	Milling	Cyaniding	Buildings	Machinery	Buildings	Slimes Plant
Superintendence	.....	$150.00	$80.00	$30.00	.....	.....	.....	$30.00
Labor	$295.82	973.66	250.10	99.44	$80.10	.....	$15.20	$225.30
Supplies	52.09	280.86	6.56	671.02	1.29	2.79	12.00	122.16
Kitchen	233.21	805.90	194.05	81.89	68.36	.....	3.50	138.37
Power	.....	13.58	118.93	.....	.....	.....	.....	.....
Assaying	.....	14.43	.....	11.14	.....	.....	.....	.....
General expense	.....	272.46	181.64	90.81	45.41	45.41	.....	272.46
Timber and lumber	.....	168.22	2.52	22.72	.....	.....	28.12	17.94
Totals	$581.12	$2679.11	$833.80	$1007.02	$195.16	$48.20	$58.82	$806.23
Cost per ton	$0.2318	$1.06865	$0.33259	$0.40168	$0.07784	$0.01922	$0.02345	$0.32160

of 25c., with an efficiency of less than half of either.

Transportation

The methods of transportation in use are crude and costly. There are no wagon roads in the country; trails are made by cutting down the dense jungle, but no work is ever done on the trail itself. Oxen are used almost exclusively as pack animals and pack about 200 lb. of freight. Their sharp split hoofs cut the clay soil and puddle it until the trails are but a series of mud-filled holes a few feet apart with harder ridges between. It is impossible to do justice to the atrocity of the Nicaraguan "roads." The excessive rains have much to do with keeping the roads in bad shape, as it rains practically all the time, the yearly rainfall being, more or less, 130 inches.

In view of these conditions, it will be clear that the tariff is high on freight that comes from New Orleans, via Cape Gracias up the Wanks river and overland a five-hour trip. We figure ordinary freight at 7c. per lb., from New Orleans to the mine; pieces weighing from 125 lb. to 500 lb. cost about 8c. per lb. In addition to this freight rate of $140 to $160 per ton must be figured the extra cost of packing, for every perishable article must be sent in hermetically sealed tin-lined cases or drums. This condition of transportation causes, for example, prices like the following: Lime, 10c. per lb.; sheet zinc, 15c. per lb.; gasolene, 87c. per gal.; shoes and dies, 14c. per lb.; 8 to 10 in. round timbers, any length, hard wood, cost 6½c. per lineal foot; cordwood costs $8 per cord; sawed cedar lumber, in conventional sizes, $100 per thousand.

Power

To offset the disadvantages the company has an ideal power; a natural waterfall and abundant water, 1½ miles away. This power drives a 150 kw. generator, and the power, transmitted under 2300 v. to the mill, is stepped down to 440 v., and drives all machinery by individual motors. Thus the motive force costs little or nothing and is most satisfactory in its operation.

The accompanying cost sheets show the distribution for the months of April and May, 1911. The item "outside development" in April, is work done on an adjoining claim; and the item "construction" in both months, is for grading for new tanks, new classifiers and general preparation for slime plant and filter installation that will be made in a few months.

In spite of the serious handicaps, the cost per ton compares favorably with almost any other mining camp treating the same tonnage. Indeed, there are few mines that can show lower cost. It is the plan of the company to rectify the system of mining in use here; handling all the ores through the lowest level, and thus materially decreasing the cost of tramming; to sink and begin mining from the lower levels; to install a modern mill, grinding all the ore fine and cyaniding it without amalgamation, and to install electric haulage from outlying properties. When these improvements shall have been made, it is quite safe to predict that on a basis of 3000 tons crushed per month, the total cost of mining and milling will not exceed $2.50 per ton.

RECAPITULATION OF SIEMPRE VIVA COSTS

	April, 1911		May, 1911	
	Total	Per Ton	Total	Per Ton
Mining	$3170.95	$1.1539	$3260.23	$1.30045
Extraction	2429.67	0.8842	1840.82	0.73427
Maintenance	622.61	0.2268	243.36	0.09707
Operating costs	$6223.23	$2.2649	$5344.41	$2.13179
Outside development	168.72	0.0614	.....	.....
Construction	453.76	0.1648	865.05	0.34505
Interest	375.00	0.1364	375.00	0.13640
Depreciation	200.00	0.0727	200.00	0.07270
Total cost	$7420.71	$2.7002	$6784.46	$2.68594

Portland Canal Ore Deposits*

The deposits of the Portland Canal district, British Columbia, may be generally grouped into two classes: (1) Veins, mostly quartz; (2) Irregular replacement deposits.

The quartz veins have a northerly trend, and the dip is usually westward, varying from 20 deg. to nearly vertical. While most of the veins are small, from 2 to 4 ft. in width, a number are exceedingly strong and persistent. The most notable of these is the vein on which the Portland Canal Company's mine is situated, south of Glacier creek. It is traceable for over two miles and is probably four miles long. The width varies from 10 to 60 ft. with a probable average of 20 ft. North of Glacier creek there are several well defined veins, the largest of which is 27 ft. in width. Other large quartz viens occur on Bitter creek south of the Bromley glaciers.

*Summary Report, Geological Survey branch, Department of Mines, Canada, 1910.

The Minerals

The principal metallic minerals in the large quartz veins are pyrite carrying gold, silver-bearing galena, blende and occasionally notable quantities of native silver. Pyrite is always the most abundant mineral present, and in portions of the veins is often the only one. Where it occurs in masses it is usually associated with subordinate quantities of galena and some blende.

The distribution of the metallic contents of veins is extremely irregular. The veins are seldom barren, and small bunches of ore are common, but concentrations large enough and rich enough to be of commercial value are rare. One such deposit is now being worked by the Portland Canal Mining Company, and others may be discovered as exploration proceeds. Several promising portions of veins are now being investigated.

Veins ranging from a few inches to six feet in width are common in the Bitter creek slates, in the dioritic area at the head of Glacier creek. The gangue in the smaller veins is more varied than in the larger ones. Quartz is nearly always present, and a few of the veins consist entirely of that mineral, others have calcite as the principal gangue, or a mixture of calcite and quartz, and occasionally the filling consists of siderite.

Replacement Deposits

The gangue in the replacement deposits is mostly the more or less altered country rock, although some quartz is usually present and in places there is a considerable development of this mineral. Calcite and barite also occur but are less common.

The metallic minerals in these deposits are generally similar to those in the veins, except that pyrrhotite is occasionally present in place of pyrite. The proportion of chalcopyrite is probably greater on the whole, and the proportion of galena less. Pyrite is usually the principal mineral present. The pyrrhotite is always, so far as known, low grade.

Illuminating Gas from Blast Furnace Dust

The British alkali inspector, in his latest report, notes that for several years the Dalmellington Iron Company has been supplying the village near the works with illuminating gas. In place of coal a waste material removed from the blast-furnace flues is now fed into the gas retorts; a coke containing 60 per cent. of carbon and a valuable proportion of iron remains after gasification. This is returned to the blast furnaces. Thus, instead of rubbish, costing money for removal, the iron company obtains coke and iron, and the villagers have a 50 per cent. reduction in their gas bills.

High Temperature Measurements

By F. T. Havard*

A résumé of methods of measuring high temperatures with pyrometers and by calorific calculation together with synopses of the principles of operation of the instruments.

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Almost every engineer and metallurgist wishes to ascertain the temperature of his furnace, of waste gases, of the blast, and, in some cases, of slag, matte and hot metal. Such knowledge will conduce to acquaintance with results which will indicate where and how economy in fuel consumption or more rapid smelting may be realized. In coal-fired reverberatory furnaces the proportion of fuel to ore smelted varies in different places more than the different conditions would seem to justify. In gas-fired furnaces the coal average, or ratio of coal used to work done in the furnace, is still more variable. The gas in producer plants varies from day to day in chemical composition and calorific power. The carloads of coal and coke may change in quality and the fact may not be realized until the record of the furnace makes it clear. It needs, then, little argument to convince the most conservative of the mining and metallurgical industry that the fields of pyrometry and calorimetry are worth exploiting.

Alloys and Mixtures of Known Melting Temperatures

The progress in the manufacture of exact thermometers and pyrometers has been more active in the last few years than in any previous decade. The later editions of Percy and the earlier books of Kerl are filled with methods of reading high temperatures by the use of the fusion points of alloys and metals. Later, mixtures of feldspar with clay or gypsum were used, which led to the introduction by Seger of his well known scale. The metal scale, still used to a limited extent in Germany, consists of thin metal sheets of composition and temperature of fusion as follows: (1) 800 parts silver, 200 parts copper, 850 deg. C.; (2) 950 parts silver, 50 parts copper, 900 deg.; (3) silver, 954 deg.; (4) 400 parts silver, 600 parts gold, 1020 deg.; (5) gold, 1074 deg.; (6) 950 parts gold, 50 platinum, 1100 deg.; (7) 900 parts gold and 100 parts platinum, 1130 deg.; (8) 850 parts gold, 150 parts platinum, 1160 deg.; (9) 800 parts gold, 200 platinum, 1190 deg.; (10) 750 parts gold, 250 parts platinum, 1220 deg.; (11) 700 parts gold, 300 platinum, 1255 deg.; (12) 600 parts gold, 400 parts platinum, 1320 deg.; (13) 500 parts gold, 500 platinum, 1385 deg.; (14) platinum, 1775 degrees.

The disadvantage of this metal scale lies in the slow fusion of the platinum alloys. The original scale of feldspar mixtures was succeeded by the Seger scale, in which various mixtures of quartz, feldspar, marble, alkalis, and pure clays form a fairly accurate scale with differences of from 20 to 30 deg. between the fusion points of the different mixtures. The clays or clay mixtures are sold in the form of small pyramids and numbered in such a manner that No. 1 melts at 1150 deg. C., while the scale runs down to No. 0.022, which melts at 590 deg. C., and up to 42, which melts at 1970 deg. C. The composition of the cone which melts at 970 deg., for instance, which is called No. 0.09, is as follows: 3.55 SiO_2; 0.45 B_2O_3; 0.3 Al_2O_3; 0.2 Fe_2O_3; 0.3 K_2O; 0.7 CaO. A mixture melting at 1690 deg., called No. 28, is composed of Al_2O_3. 10 SiO_2.

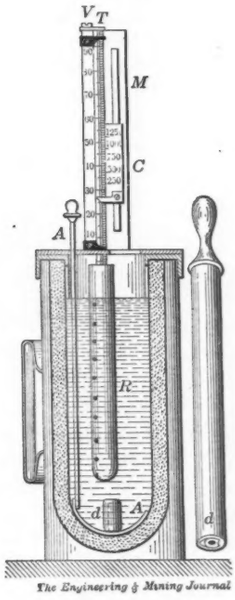

FIG. 1. STANDARD WATER PYROMETER

To determine the temperature of a kiln or furnace it is necessary to use three cones. If we know, for example, that the approximate temperature of the vessel is 1500 deg., we would place on a brick in the kiln, or on a suitable support in the furnace, cones No. 17, 18 and 19, which fuse at 1470, 1490 and 1510 deg. C. Supposing cone 19 did not fuse at all, cone 18 "sweated," and cone 17 melted, we would know that the temperature of the vessel was between 1470 and 1490. The cones find their greatest application in the ceramic industries, and are used almost invariably by makers of high-grade refractories.

The Water Pyrometer

More exact methods of determining temperatures are provided by thermometers and pyrometers of the resistance, thermoelectric and optical types, and further (where extreme accuracy is not required) by the water pyrometer. Before the development of the first-named types of pyrometers, the water pyrometer, Fig. 1, served a useful purpose in the field of metallurgy. It was simple in construction and easy to manipulate. The quicksilver thermometer cannot be used for temperatures above 550 deg. C., even when compressed gases, such as nitrogen are used in the capillary tube and about 350 deg. C. is the limit of the ordinary vacuum thermometer. It has been replaced to some extent by the water pyrometer, which may be employed in reading temperatures up to 1500 deg. Centigrade.

The apparatus of a Siemens water pyrometer consists of a disk of nickel, platinum or copper, a can containing more than a pint of water, and a thermometer and scale. The cylinders, or disks, are so adjusted that their heat capacity at ordinary temperatures is equal to one-fiftieth of that of the copper vessel with the pint of water. To measure furnace temperatures it is only necessary to hold the disk in the furnace by a pair of tongs until it has assumed its temperature; then, withdrawing the disk, it is dropped into the water and the rise in temperature which the thermometer records, is noted. A scale at the side of the thermometer scale shows the temperature. This corresponds to the level of the meniscus of the mercury. This high temperature scale is tested before the pyrometer leaves the factory, for the actual rise in degrees of the mercury will represent a different value on the high-temperature scale for different water contents of the can.

Copper disks are used in the reading of temperatures up to 900 deg.; nickel, 1300 deg., and platinum, 1500 deg. C. Generally, one pint of water is used and the disks weigh, respectively, 137, 117 and 402 grams. The actual temperature of the furnace will be represented by the addition of the reading on the high-temperature scale to the gain in temperature on the thermometer scale caused by the communication of the heat of the disk to the water in the can. The application of the water pyrometer is found more generally in steel works, for example, where the temperature of armor plate in the course of finishing

will be decided by placing a disk on it and then reading the temperature after dropping the disk in the can.

Electrical Pyrometers

Of the pyrometers which are now used, the resistance type, constructed upon the principle that heated platinum wire has a different electrical conductivity than the cold metal, is employed for measuring temperatures up to 1000 deg. C. The thermoelectric pyrometer depends on the principle that when two metallic wires have two junctions, the one at the temperature of the atmosphere, the other in a furnace or hot body, an electromotive force is induced, which is a function of the materials and of the difference of the junctions, and causes an electric current to flow through the closed circuit and is used with such couples as copper-constantan for temperatures up to 500 deg.; platinum-platinum rhodium for temperatures up to almost 1500 deg., and platinum-platinum iridium up to 1500 deg., while nickel-nickel chromium alloys are employed for the reading of temperatures up to 1000 degrees.

The electrical-resistance pyrometer consists of two essential parts: the coil, Fig. 2, and the indicator. The former is a coil of platinum wire wound about two strips of mica and inclosed in a porcelain tube. Under these conditions the resistance of the coil undergoes no change and may be used for an indefinite number of times with concordant results. The coil of platinum wire, about 1 in. long, is wound on the mica plates, and connected to heavy copper or platinum leads insulated from one another by mica. These leads are connected to binding posts in the handle of the instrument. Compensating leads of the same size as the conducting bands extend from the platinum coil to the binding posts, and from them the two sets of leads are connected to opposite arms of a Wheatstone bridge. The resistance of conducting leads and that of the compensating leads balance each other, so that the change in resistance, as measured on the Wheatstone bridge, is due solely to the resistance of the platinum coil, which varies with the temperature. The electric-resistance pyrometer may be used both for temperatures below zero, as well as for temperatures up to 1000 deg. C., just above which platinum begins to volatize and the resistance is increased. The temperature may be read on a dial, which is scaled in Fahrenheit or Centigrade degrees. The system of wire connections is shown in Fig. 3, diagrammatically.

The thermoelectric pyrometer or thermocouple is capable of measuring temperatures approaching the melting point of platinum. For general purposes, one of the wires which compose the couple is platinum alloyed with 10 per cent. rhodium, while the other is pure platinum. When the couple protected by a porcelain tube and connected with the milli-voltmeter is inserted in the furnace or oven, an electromotive force is produced and may be measured on the galvanometer scale, which is calibrated in millivolts and degrees. The thermoelectric pyrometer is almost instantaneous in its indications of the temperature; a reading may be made in five seconds after insertion in the heated body, or, if desired, it may be left permanently in the furnace and the temperature may be written on an automatic scale recorder.

Optical Pyrometers

Where contact with a hot body, gas, or flame is difficult to establish, the temperature may be read under normal conditions with fair accuracy by means of an optical pyrometer. The types of optical pyrometers in general use are the Féry radiation, the Féry absorption, the Wanner, the Thwing and the Holborn-Kurlbaun instruments. The Féry radiation pyrometer finds its field of usefulness in the range of high temperatures. Since the pyrometer is always placed at some distance from the furnace and no part of it becomes excessively hot, it is always in good order, and work with it is both rapid and comfortable. The principle of

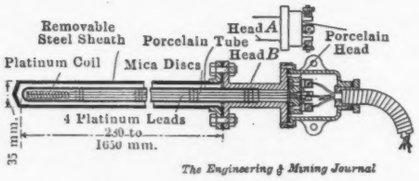

Fig. 2. Platinum Coil of Resistance Pyrometer

construction of the radiation pyrometer is this; the radiation which emanates from a hot body or which passes out through an observation hole in the wall of the furnace, falls upon a concave mirror and is thus brought to a focus. In this focus is a thermoelectric couple, the temperature of which is raised by the radiation falling upon it. The couple is connected with a galvanometer recording the temperature in millivolts and degrees. The hotter the furnace, the greater the rise of temperature of the couple. The arrangement of the pyrometer precludes any influences that would impair accuracy from the size of the hot body or observation hole, and also from the distance of the pyrometer from the hot body or furnace. Thus the temperature of a stream of molten steel was found to measure the same whether the pyrometer were 3 ft. or 60 ft. distant. The instrument may be used continuously and be connected to a recording heat register.

For measuring the temperature of such small hot bodies as incandescent filaments, the Féry absorption pyrometer has found some application. It consists of a small telescope which carries a small lamp called the comparison lamp. The image of the flame of this lamp E, Fig. 4, is projected on a mirror F at 45 deg., placed at the principal focus of the telescope. A narrow vertical strip $a\,b$ of this mirror F is silvered. The telescope is focused on the object, which is viewed on either side of the silvered strip. By means of a pair of absorbing glass wedges C and C_1, which are moved laterally by a micrometer screw, the light from the object is made photometrically equal to that of the comparison lamp. An auxiliary dark glass D enables the instrument to work over a higher range of temperature. By reference to a table, the readings obtained may be read in Centigrade degrees. In the figure, K represents a crucible on which the telescope is focused.

The Wanner Optical Pyrometer

The Wanner is an optical pyrometer, which can measure temperature in one type of instrument from 625 to 1000 deg.; in another, from 900 to 2000 deg. Its use involves the comparison of the quantity of light emanating from the heated mass with a constant source of light. In order to be able to measure low temperatures and minimize loss of light in passing through the apparatus, a small two-volt osmium lamp, placed within the vertical handle which joins the horizontal optical tube, is used as the standard light. A battery provides current for the osmium lamp, which may be standardized with an amyl-acetate lamp. A handle moving round a dial scale just below the eye-piece raises or lowers the osmium lamp in the optical tube and adjusts it to equal fields of brightness with the amyl-acetate lamp or the furnace.

In adjusting the pyrometer the amyl-acetate lamp is placed at the end of the pyrometer opposite the eye-piece. This lamp is provided with sights which are placed in a line with the pyrometer, then the osmium lamp is connected with the battery. Now on looking through the eye-piece and closing the circuit by pressing the button of the handle, a red illuminated circle becomes visible; the upper semicircle is lighted by the amyl acetate, the lower by the osmium incandescent lamp. When the two semicircles are adjusted to equal brightness the pyrometer is ready for use. To measure the temperature of a furnace, the amyl-acetate lamp used for standardizing is removed and the pyrometer is pointed toward the door or source of heat, comparisons of the illuminated semicircles are made and adjusted to equal fields. By means of the figure or number obtained from the scale of adjustment on the pyrometer, the temperature is read from a table. To adjust the pyrometer fitted with voltmeter, the amyl-acetate lamp is lighted as before, adjusting it to normal conditions, and the pyrometer osmium lamp is corrected to equally il-

luminated fields. The voltage on the meter is that at which the osmium lamp is burning. The voltage of a new osmium lamp is given by the manufacturers.

Other Methods of Temperature Determination

When no pyrometer is at hand, temperatures may be relatively calculated from these data: the weight of the fuel used, its calorific value, the weight of the products of combustion and their specific heat. For example, if carbon is burned to carbon monoxide in air, the temperature T produced would be found by the following formula, wherein W is the weight of the carbon; A, its calorific

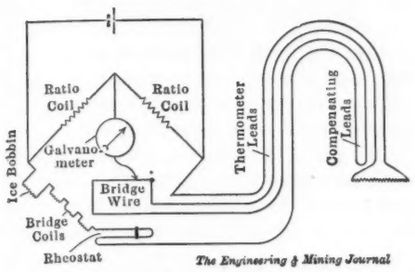

Fig. 3. Bridge Wiring for Resistance Pyrometer

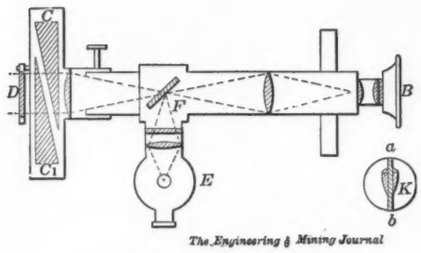

Fig. 4. The Fery Absorption Pyrometer

value; X, the weight of carbon monoxide produced; B, its specific heat; Z, the weight of nitrogen; C, its specific heat.

$$T = \frac{WA}{XB + ZC}$$

If $W = 1$ kg.; $A = 2473$; $X = 2.33$ kg.; $Z = 4.46$ kg.; $B = 0.248$ and $C = 0.244$, then according to the formula:

$$\frac{1 \times 2473}{(2.33 \times 0.248) + (4.46 \times 0.244)} = T = 1486 \text{ deg. } C.$$

Since, however, carbon and oxygen do not combine at zero, we must add the heat already provided to effect their combination.

For instance, suppose the carbon to be heated by the gases rising in the shaft of a furnace. Let us assume that the temperature of these gases is 1200 degrees. Then 1 kg. of carbon will, in addition, furnish the extra calories obtained from being heated to 1200 deg., which amounts to 1200×0.22 (the specific heat of carbon) or 264 calories. Then the real heat produced by the combustion of 1 kg. of carbon will be

$$T = \frac{2473 + 264}{(2.33 \times 0.248) + (4.46 \times 0.244)} = 1659 \text{ degrees.}$$

Should the air or blast be heated to say 400 deg., we have a further increase of heat value and raising of temperature by the following amount: The quantity of air used to burn 1 kg. C. is 5.79 kg.; its specific heat is 0.237, its temperature 400 deg. Hence:

$$5.79 \times 0.237 \times 400 \text{ deg.} = 548$$

therefore:

$$T = \frac{2473 + 264 + 548}{(2.33 \times 0.248) + (4.46 \times 0.244)} = 1973 \text{ degrees.}$$

Similarly, if the temperature be known, the total heat energy may be calculated thus:

$$W = T\,(QS + Q_2S_2 + \text{-----})$$

where Q = the products of combustion. The temperature indicated by the preceding calculations will be diminished by the loss of heat, such as is demanded for warming the walls of the furnace, for radiation, and for effecting chemical dissolution of compounds.

Effects of Moisture

The rule is, that every increase of the products of combustion without corresponding increase of the heat energy reduces the temperature of combustion. Nitrogen and moisture in air are accordingly dead weights. Moisture is particularly detrimental to high temperatures on account of its high specific heat. Accordingly, the less moisture and the less nitrogen we have in the air for combustion, the greater the temperature we produce. We cannot control the nitrogen, but we can often eliminate the moisture. The appended calculations show the relative value of producer gas with and without moisture:

The gas in question with 17.4 per cent. moisture, had the composition shown in Table I.

Let T'' represent the temperature produced with moisture content, and T' represent the temperature produced without moisture.

With 1 kg. gas

$$T = \frac{(\text{weight } CO \times \text{cal. value}) + (\text{weight } CH_4 \times \text{cal. value}) + (\text{weight } H \times \text{cal. value})}{(\text{weight } CO_2 \times \text{specific heat}) + (H_2O \times \text{specific heat}) + (N \times \text{specific heat})}$$

$$T' = \frac{(0.1402 \times 2403) + (0.168 \times 1200) + (0.0079 \times 28{,}780)}{(0.507 \times 0.217) + (0.109 \times 0.480) + (1.835 \times 0.244)} = 1255 \text{ degrees.}$$

$$T'' = \frac{(0.1159 \times 2403) + (0.0139 \times 1200) + (0.0066 \times 28{,}780)}{(0.419 \times 0.217) + (0.263 \times 0.480) + (1.517 \times 0.244)} = 1082 \text{ degrees.}$$

Note that the CO_2 and H_2O result as shown in Table II.

Had regenerative checkers been used in the furnace in which the gases were burned, the calculations would be modified. To the calorific value as obtained above would be added the heat energy produced from the quantity of gases passing through the checkers. This, multiplied by the specific heat and then by the temperature of the checkers, say 400 deg. C., represents the heat energy.

TABLE I

	Per Cent. by Volume	Per Cent. by Weight, Without Moisture	Per Cent. by Weight, With Moisture
CO_2	11.8	19.42	16.10
CO	13.4	14.02	11.59
CH_4	3.0	1.68	1.39
H	10.5	0.79	0.66
N	61.3	64.09	53.02
moisture			17.24
	100	100	100

TABLE II

Weights of products from combustion of 1 Kg. Gas	In Gas Without Moisture	In Gas With Moisture
CO_2 itself	0.194	0.161
CO_2 from combustion of CO	0.220	0.182
CO_2 from combustion of CH_4	0.093	0.076
Total CO_2	0.507	0.419
	In gas without moisture	In gas with moisture
H_2O from CH_4	0.038	0.032
H_2O from H	0.071	0.059
Moisture	*nil*	0.172
Total H_2O	0.109	0.263
N itself	0.641	0.530
N drawn in with O in air which forms $CO_2 + H_2O$ with $CO + H$.	1.194	0.937
	1.835	1.517

Then:

$$T = \frac{765.382 + 400 \times 0.24}{0.61} = 1411 \text{ degrees,}$$

and

$$T'' = \frac{635.496 + 400 \times 0.28}{0.587} = 1273 \text{ degrees.}$$

The difference in the specific heats of the gases calculated as T' and T'' is due to the content of moisture in the latter.

Occurrence of Struverite

A mineral classed in the strüverite group because of its high percentage of tantalic acid has been observed in the Black Hills, S. D. In describing this mineral, Frank L. Hess and Roger C. Wells say that it belongs to the tetragonal system, crystallizes like rutile and contains titanium, columbium, iron and tin. Essentially it is titanium oxide with iron tantalate and columbate. The formula approximates to FeO $(Ta, Cb)_2 O_5$ 6 Ti O_2, tin being an unessential minor constituent.

Witwatersrand Mining Costs—II

By E. M. Weston*

Shaking chutes are economical for moving ore in stopes. Sand and waste largely used for filling stopes. Greater economy and increased efficiency required to keep down future costs.

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In the mines on the Rand ore is moved from the face of the stopes to the levels below by self-acting ground or aërial tramways, by shaking conveyers suspended from the hanging wall of stopes, or by hand labor by shoveling. The cost of this work depends on: Hight of stope; nature of foot wall, whether smooth or irregular and broken by faults; angle of dip of stope, the average being about 30 deg; and the distance between the levels. The cost was reduced during the last few years by the use of conveyers, especially the shaking-chute type. On the New Kleinfontein mine conveyers vary in length from 30 to 250 ft. and on an average are considered to save the labor of six natives each or about 480 natives in the whole mine. The cost of this work is generally shown in conjunction with that of tramming along the levels to the shafts and this again varies with the average length of haul and the condition of the levels. Contracts are often let for the whole mine for shoveling and tramming on a tonnage basis. E. J. Way gives 1s. 9d. for this cost and it may vary from 1s. to 2s. 6d. per ton.

Conveyance along levels is a branch of mining work which was somewhat neglected in the past. Levels were driven closely following all the sinuosities of the banket beds and never were straightened. Tramming was done only by native labor, one native pushing a truck of 16 to 18 cu. ft. capacity over a line with 18-in. gage laid with 16- or 20-lb. rails, and it was considered that the tonnage available over any ore levels did not warrant the installation of mechanical haulage devices.

The late Wager Bradford endeavored to introduce monorail tramming, but, owing to cost of installation and upkeep, to trouble caused by movements of the hanging walls after stoping and to accidents, this system proved a failure. On the Cason section of the East Rand Proprietary mines the main-and-tail-rope system of haulage has been installed in one level and it shows a reduction of 50 per cent. in cost compared with hand tramming. What hand tramming per ton mile costs on the Rand nobody seems to know. It is, however, certainly not less than the cost of similar work in British Collieries and I should say it was about 1s. 6d. per ton mile. The East Rand Proprietary mines are doing a great deal of excess development to allow of an extension of the haulage systems. New mines are being laid out with longer distances between levels. Main-haulage drives will in some cases be driven in the foot wall and especially designed to facilitate haulage, while drives on the reef will be straightened as far as possible.

With an abundant supply of cheap electrical power at 4 to 5d. per unit, underground haulage should gain in favor. With so many unskilled, ignorant laborers in the mines the risk of accidents due to contact with live wires is great. This fact, together with the high cost and liability to damage by blasting of overhead electrical installation, will, I think, prohibit its use except in special cases. Motors worked on the accumulation system, though more expensive in operation, appear more suitable.

Gasolene Motors Being Tried

I do not think that the mines will face the high capital outlay necessary for a system of air compressors and piping to supply air at 800-lb. pressure or over to air-tank locomotives, though these with reheater tanks work with a surprisingly small total mining cost. Gasolene motors are being experimented with; but it seems that the cost of fuel will be somewhat high and ventilation must be improved in most mines before the fumes from exhaust would cease to be an objection. Horse or mule traction underground has scarcely been attempted, though with improved ventilation and a little attention to the levels their use should reduce tramming costs to 3 to 6d. per ton mile.

The economies that are possible in underground haulage in both number of native laborers and in cost are strikingly shown by the data giving the latest cost in German mines. Incidentally its use would lead to the employment of a greater proportion of skilled white laborers as locomotive drivers. Horse and mule haulage, 2 to 4d per ton mile; rope haulage, 1 to 2d.; overhead electric

Flying Fox Used in Opencut Workings on Outcrop of Main Reef on Crown Mines

Mining at Village Main Reef Quarry Has Helped to Reduce Rand Costs

locomotives, 0.44d.; accumulator electric locomotives, 1.85d.; benzol motors, 1.61d.; compressed-air locomotives, 1.2d.

The cost of timber for securing levels and stopes is generally a small item in working costs and runs from 1d. per ton upward, with an average of perhaps 2 to 3d. On some of the Roodepoort mines where the ground in the stopes is treacherous timbering costs from one shilling in the Roodepoort United main reef to 1s. 5d. in the Roodepoort Deep.

Stopes Filled by Sand and Waste

As noted before, much work is being done in the upper levels of the mines in extracting pillars and blocks of low-grade ore and endeavoring to secure the hanging walls of stopes by means of waste packs with or without timber bulkheads or "chocks." On the Ferreira mine last year 30,000 tons of waste were thus built into packs. The sand filling of stopes is now being started. What the cost will be per ton sent down or per ton milled cannot yet be stated; but by treating the sand direct from the cyanide vats with permanganate of potash ¼ lb. to the ton as a 5 per cent. solution, or about the same amount of chloride of lime, costing 0.35d. per ton treated, it can be returned directly to the mine in the proportion of 60 per cent. sand and 40 per cent. water, doing away with the cost of 5 to 6d. per ton for sending sand to the waste dumps. Costs of sand filling have so far been high, up to 1s. 8d. per ton; but the cost of packing waste is avoided and the mines are made safe. Some pillars can be extracted; but the trouble is that some cheap binding material is required to make the sand set solid, otherwise the loose sand will always be a danger and it will be impossible to remove the pillars over the levels. Sand filling will be necessary in mining at great depths; but whether it will permanently add 6 to 9d. per ton milled to the working costs or whether its use will allow of direct savings in mining greater than its cost depends on the development of the process. Crushed decomposed surface rock, soil and ashes may be found useful binding materials. The practice of leaving pillars interferes greatly with stoping efficiency and sand filling may obviate this.

Pumping Costs Generally Low

The cost of pumping is on the whole small. In deep mines, such as Robinson Deep, Simmer Deep and Simmer East, the cost varies from 2.4 to 3.6d. per ton milled.

A few mines are exceedingly wet. In the Knights Deep mine about 1,250,000 gal. are pumped from about 2000 ft. A large number of small electrical pumps are installed; there being nearly 30 pumps in the mine, and consequently the cost of pumping is high and amounts to from 9.4d. to 1s. 1d. per ton milled. A revenue is, however, derived from the sale of the water. Cost of pumping 100 foot-tons was in 1906: With electrical pumps, 0.310 to 0.710d.; single-cylinder, rod-driven Cornish pumps, 0.367d.; and bailing by winding engines, 0.169d. With large electrical three-throw pumps using purchased current at 0.5d. per unit the cost of pumping should not exceed 0.2d.

To 2000 ft. in a vertical shaft a modern rod-pumping system of the Cornish engine or Davey type as installed in Waihian and Tasmanian mines would pump water quite as cheaply. Lifts of 1000 to 1500 ft. are common with electrical pumps. A Hoppe pump lifting 2000 ft. direct was installed in the Angelo Deep shaft; but I believe it gave trouble and is not now in use. In the East Rand basin, much of which is overlain by dolomite, heavy water is encountered. The Geduld mine pumps nearly 1,000,000 gal. per day from 2000 ft. and this probably raises the mining cost 8 to 10d. per ton milled. Other mines in this area sinking and developing are also greatly troubled with water.

On the far West Rand a dolomite sheet 1700 ft. thick has to be pierced to reach the extension of the Randfontein series of reefs. Here a shaft is being sunk circular in area with underhung iron tubbing and two electrically driven Sultzer centrifugal pumps capable of raising 10,000 gal. per hour will be put in. A hydraulically operated pump is working on the Rietfontein mine.

Hoisting

In the outcrop mines hoisting was done by twin-cylinder, direct-acting engines, and in the deep mines by cross-compound engines, generally with conical drums, or by Whiting hoists. Electrical hoists were used for underground hoisting on inclines. Owing to the fact that the Victoria Falls and Transvaal Power Company is supplying electric current at 0.5d. per unit, electrical winders, generally with Ward-Leonard system of controls, are being started up on a number of mines. One was recently given a satisfactory trial on the Village Main Reef. The cost of hoisting varies from 6d. to 1s. per ton. It is expected that on the Rand Collieries mine ore will be hoisted from 3000 ft. for 3d. per ton.

The costs of sorting, crushing, and surface transport to mills are generally grouped together and vary from 5.5d. at the Simmer & Jack mine to 1s. 7d. in the Roodepoort Central Deep. The amount of waste sorted out in the Simmer & Jack is 10 per cent. and in the Princess Estate 33 per cent. With a large mine hauling from two shafts with a central battery sorting 15 per cent. this cost should not exceed 6 to 8d. per ton milled.

Cost of Stamp Milling

The cost of stamp milling is 2s. 9d. per ton milled at the New Unified with an old mill treating 10,000 tons per month; 1s. 4d. on Witwatersrand mine; 1s. 2d. plus 8d. for tube milling at the Simmer & Jack; 1s. 3d. plus 7d. for tube milling at the Simmer East; and 1s. 7.5d. plus 10.5d. for tube milling at the new Simmer Deep mill. This latter cost will, however, be reduced when current is available at 0.5d. per unit. Several of the larger mines publish only the total reduction expenses including sorting, crushing, milling, cyaniding sand and slime, and disposing of sand and slime residues to dumps. The New Kleinfontein mine is the only one not using tube mills and it will be noted that the reduction expenses are among the lowest on the Witwatersrand.

Cost of Cyanidation

In the larger plants the cost of cyaniding sands is reduced to about one shilling per ton milled, or taking two-thirds of the product to be sand, the cost per ton treated will be about 1s. 4d. to 1s. 6d. The cost of sand treatment per ton milled at Simmer & Jack is 1s. 0.7d.; at Robinson Deep, 1s. 1.6d.; and at Simmer East, 1s. 5d. Of this the cost of disposal of residues to the sand dumps is from 4 to 8d. per ton dumped.

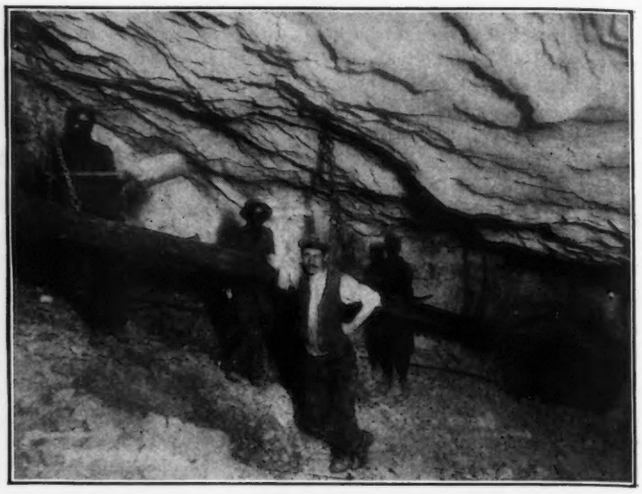
The cost of slime treatment is only from 5 to 7d. per ton milled and the proportion of slime is from 30 to 40 per cent. of the ore milled, say 33 per cent. The cost per ton milled at Simmer & Jack is 4.8d; at Robinson Deep 6.7d.; and at Simmer East 5.4d. The cost per ton treated is 15 to 18d. with cost of slime dumps included.

The development costs to be charged per ton milled will vary with the width and continuity of the gold-bearing rock in the orebody and must increase as the poorer and thinner reef areas of a mining district are attacked. This must take place in course of time on the Rand. The actual expenditure on development in the mines varies from time to time. When labor is plentiful, development is pushed since there is no expense for timbering in maintaining drives as there is in some mining districts. When labor is scarce, development is somewhat neglected. However, a certain fixed charge per ton milled is made on the basis of the average cost of developing a ton of ore as shown by experience, and so published costs do not vary greatly.

Development Costs

It must be noted that in the mines showing the lowest total costs today on the Rand and which help so largely in reducing these costs to an average of

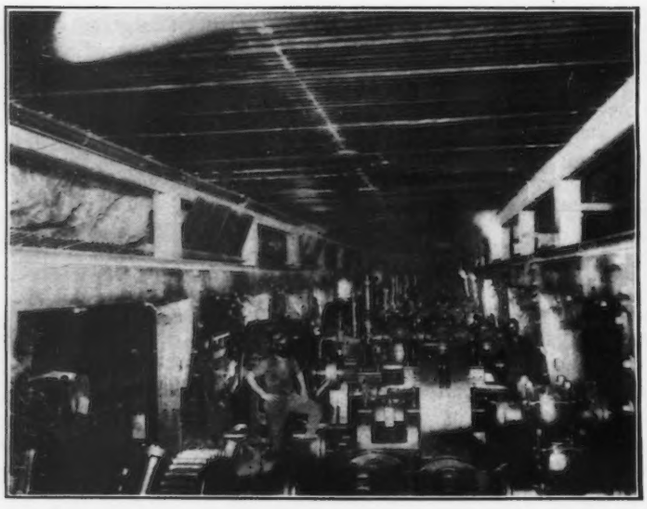
SELF-ACTING AERIAL TRAMWAY AT NOURSE DEEP. TWENTY-FIVE 5-CWT. TRUCKS WERE LOADED AND SENT DOWN 150 FT. IN ONE-HALF HOUR



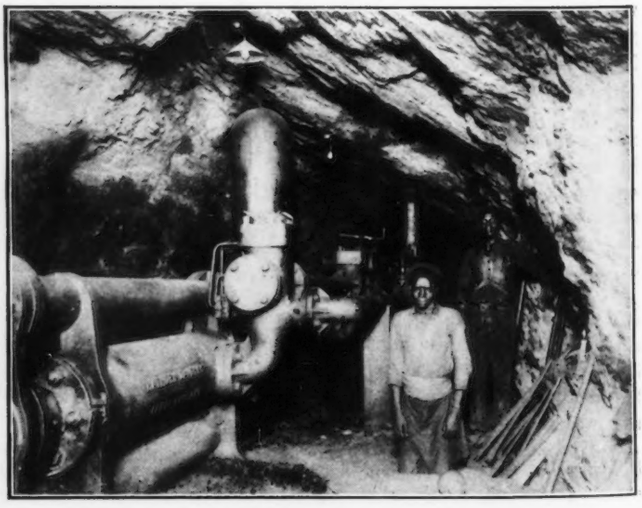
SHAKING CHUTES FOR MOVING ORE IN STOPES AND RISES HAVE REDUCED SHOVELING COSTS

PUTTING IN STULLS TO KEEP UP SHATTERED HANGING WALL AT ROBINSON

CHOCKS FILLED WITH WASTE LARGELY USED INSTEAD OF PILLARS



ELECTRIC PUMPING STATION AT KNIGHTS DEEP, THE LARGEST ON THE RAND. RAISES 40,000,000 GAL. PER MONTH FROM 1000 TO 2000 FEET



HYDRAULIC PUMP, NEW RIETFONTEIN. WATER IS COMPRESSED ON SURFACE AND WORKS PLUNGER PUMP BELOW AT 60 TO 80 PER CENT. EFFICIENCY

17s. 6d., the development charge is reduced to only a few pence per ton, as development work is practically finished and these mines are reaping the benefit of work done in past periods. In mines that must develop ore as it is milled, costs will range from 1s. 11d. per ton in the Van Ryn mine to as much as 4s. 4d. in a mine with one narrow flat reef in which the ore lies in irregular areas separated by barren portions, as in the Geduld mine. On an average, for an ordinary deep mine with reefs of average width, this charge may be taken at from 2s. to 2s. 6d. per ton.

Costs of developing per foot depend on the monthly footage developed and whether the mine is doing purely development work or is producing ore. In the first case all the expenses of the mine must be charged to development costs and in the second they are mainly borne by the tonnage milled. This cost in a producing mine would be from 50 to 60s. per foot and in a developing mine from £4 to £8 per foot. These footage costs can be reduced, and doubtless will be reduced, by employing cheaper compressed air generated at a central station and using it at higher pressures than is usual today.

The work will be made more healthy by paying more attention to ventilation and to the allaying of dust by the use of water in boring holes and in spraying after blasting and before shoveling. The improved Leyner drill should yet find a place here in driving raises. Miners will be educated to attain a greater efficiency. The use of hammer drills with air-feed attachment using solid steel for putting up box holes in level pillars and for raising has already reduced the cost of this work nearly 40 per cent. as compared with piston machines.

General and Office Expenses

It is in the department of general mine and head office expenses that the influence of large outputs in reducing costs is most marked. Some head office and central administrations are carried on much more economically than others. The East Rand Proprietary Company's published accounts show only 6.5d. per ton milled on 200,000 tons per month for these costs. In the New Kleinfontein the cost is 7.25d., but in the Crown Mines, Robinson, Robinson Deep and Simmer East this cost is about 1s. 6d. per ton and may rise to 2s. 7.5d. in a mine like the New Unified.

As before stated different groups present the accounts of the mines controlled by them in different ways and there is a tendency to charge to capital account items that really should be included under working costs. In the accounts of the Simmer & Jack, mine repairs, renewals, etc., figure at 10s. 8d. per ton. I am afraid some companies charge such items as the cost of replacing a pump with a larger one to capital account. On the mines controlled by the General Mining and Finance Corporation, however, practically everything is now charged to working costs.

In the cases of vertical shafts sunk to reach an ore deposit, or shaft sinking done before milling is started, it may be right to charge their cost to capital account; but it appears foolish to charge to capital account the cost of sinking inclines which have to be constantly deepened to develop further tonnages of ore. Surely this is a charge that should be shown under development expenses. This seems to be a kind of blind-eyed finance and statistical juggling tending to deceive everybody concerned.

Power generated at the mines from steam costs about 3s. 6d. per ton milled, divided over compressors, hoisting, milling and various pumping expenses. By the use of purchased electrical power it is expected that this will be reduced by nearly one shilling per ton which will shortly show as a direct reduction in working costs.

Division of Total Costs

At present the total costs are divided as follows: Labor, 55 per cent., 3/5 being for white labor; explosives, 11 per cent.; coal, 8 per cent.; stores, 20 per cent.; and maintenance and general, 6 per cent. The average cost per ton milled for the total production of ore on the Rand is about 17s. 6d. per ton and the question arises, can this be reduced?

It seems to me that the position is this. The average is favorably influenced by the older mines and their cheaply won ore and may be further reduced by some of the economies mentioned while these mines last. Their life is limited, however, and large reductions in cost must be made on the bulk of the ore mined from the solid if the average is then to be reduced or even kept down. The tendency is toward amalgamations, but even if amalgamated there are numerous areas which, owing to the nature of the orebodies, cannot be as cheaply mined as the average. There are also many smaller mines with a fairly long life which will never be amalgamated and on which costs must always be high. As years go on the proportion of mines which must take their ores from greater depths and from the solid will increase.

I have dealt little with labor costs; but the tendency I think is for the cost of white labor to fall owing to a rise in efficiency and to reductions in wages due to greater local food production and a consequent lowering of prices, freights etc. The railroads make £2,000,000 profit a year, mainly from the Witwatersrand, though perhaps this money would have to be raised in some way in any case. Native labor tends to become scarcer and more expensive, but more efficient and intelligent.

Taking a deep mine today mining 70,000 tons per month from 3000 ft., through two shafts from two reefs averaging 20 in. in thickness, with the relation of stoping widths to reef widths about as shown in table III, and underground and surface sorting about 15 to 20 per cent., I should estimate the costs somewhat as follows: Mining expenses: Breaking ore, 6s.; shoveling and hammering, 1s. 6d.; and pumping, timbering, hauling, 1s.; Reduction expenses: transport, sorting, crushing, 6d.; stamping, 1s. 6d.; tube milling, 6d.; cyaniding sand, 1s.; and cyaniding slime, 6d.; development, 2s. 6d.; general and head office, 1s.; total 16s.

Tendency to Reduce Stoping Widths

The reductions possible I have already indicated but against these there is the added cost of mining from greater depths, for hoisting, ventilation and sand filling. The tendency of effort on the Rand today is to reduce stoping widths to a more reasonable proportion compared with reef widths, and the more this policy can be carried out the greater the rise in cost of milling tonnage. We note in table[1] II that the really valuable ore costs 12s., 7s. 3d. and 18s. per ton to break on reef which averages 18, 24, and 14.5 in. respectively in thickness. If stoping widths on these reefs were reduced to 36 in. the cost per ton broken would be about 7s. 6d. It is no doubt possible to reduce average stoping widths on the Rand greatly if miners can be educated up to it. If these efforts are to be continued there must be an actual rise in mining costs which, however, will mean a corresponding increase in real profits.

The Bismuth Market

Rich bismuth ores are obtained from a number of the tin mines of Bolivia, and are shipped for treatment to England and Germany. The market has always been dominated by an English concern and the Saxon government, and between them they have maintained the price at whatever point seemed good to them, at present at 7s. 6d. per pound.

It is reported by E. Shaff-Regelmann, of New York, that a new use for bismuth has been discovered, which would easily consume half as much again as the present world's consumption, and in such a way that the bismuth could not be recovered for subsequent use in the pharmaceutical industry. He is not yet ready to publish details, but states that it would not be profitable to embark on the enterprise unless bismuth could be secured at $1 per lb.; the European producers have as yet refused to lower their price to this figure, although they could easily afford to do so, with an increased consumption.

[1]Eng. and Min. Journ., Aug. 26, 1911, p. 406.

Problems on the Dip

By Josiah Bond*

An account of some erratic ore deposits; how they were prospected, developed and worked and the varying fortunes of the successive owners.

*Mining engineer, Patagonia, Ariz.

A prevalent view of the manner of finding mines is, that a prospector loads a burro with grub and tools; goes into some mineralized region, and while hunting, his burro wanders to a high-grade outcrop, then after a few days' work the prospector finds himself with a good mine or with one at least that meets with ready sale at a high price. In reality this has happened so seldom within my observation that I cannot believe it to be a common experience; so far from it that frequently good work on a splendid prospect fails to bring satisfactory returns to the prospector. I note, however, that, while in these hard times, less work is being done in many districts, what is done, is better work for the mine, and done more with the view of making producers than of making sales. But nowadays, at least, much work is required on a prospect before it can produce or before it can be sold. This work being done mostly by persons of small means must be done slowly; but while it is being done it sometimes opens curious lode formations, a few of which, noted here, may be of interest, though necessarily incomplete, as it may take years to do the work that the full story of these lodes may be told. Most of the names are those by which the prospects are known at the present time, but one is an old claim abandoned and maybe some one or two of the others have had their names changed lately.

Difficulties in Following the Dip

The case of the Joplin mine is similar to another in its neighborhood. This mine is about five miles south of Old Baldy in the Santa Rita mountains, Santa Cruz county, Arizona. A section of the pay streak is shown in Fig. 1. The shaft is 130 ft. deep. The turn in this vein is at about 100 ft. depth, following which made a poor working shaft. There was, however, a chance to run a crosscut below the turn and do further work through this tunnel. The black portions in the sketch indicate ore and the dotted lines, the shaft as sunk; the offset is about 15 ft. There are surface indications that at further depth this vein will dip to the north and still further complicate the situation. The orebody in one or two places was 2 ft. wide; lead with high silver and gold contents. At the slip the ore was not more than 3 in. thick, but rich; below the slip the ore was rich. The country rock has been determined as a granite porphyry, and the slip evidently antedates the deposition of the ore.

The vein illustrated by Fig. 2 proved to be about 12 ft. thick, and so far as is now known, the ore, containing copper and some silver, was worth $15 per ton. The outcrop occurred in a basin, short on the strike, which gave the appearance of a wide dike running up the hill. That the vein quartz was called quartz porphyry in the beginning aided in confirming this belief and no other outcrops have yet been found. The work done in the order *A*, *B*, *C* and *D* by successive owners led one after another to abandon the ground until the sixth owner sunk the shaft *E* and became convinced that what had been supposed to be the strike of the vein was really the dip, which further work proved to be the case. The ore contained much red oxide of copper, a decomposition product, in the exposed outcrop, but the ore under cover was a silver-bearing copper sulphide which is also supposed to be secondary, the original ore having not yet been developed. This vein was in andesite, the outcrop, if there is any on the far side of the hill beyond *D*, has not been found, though diligently sought for. Among persons familiar with the ground, the opinion prevails that this vein apexes under ground.

A Curious Series of Veins

The vein on the Olive claim in the Santa Rita mountains, illustrated in Fig. 3 is a puzzle. The discovery was made at the site of the shaft house and some little work was done before the claim was sold to *A*. *A* sank on ore 60 ft. and shipped $3000 worth of silver-copper ore; with no ore in sight he deserted the claim. *B* took the claim and on the theory that the vein was regular, but had pinched, sank the inclined shaft about 100 ft. to the contact. Finding no ore and no vein, he followed back on the contact about 50 ft., but stopped just short of ore. *C* took the claim when *B* let it run out, and continued on the contact a few feet, striking the lower end of the orebody marked *C* and went up on this, getting $4000 worth of ore. Thinking he had all there was, *C* sold the claim to *D* for $75. *D* continued on the contact striking the vein down which he sunk and from which he is getting good ore at the present time. In the meanwhile he leased the upper works to *E* who on some theory of his own, ran a tunnel from *C*'s upper work striking the intermediate orebody and putting in his pocket from the three veins about $10,000. How these veins were formed it yet an after-supper topic, good forever, it seems.

The hill marked *A*, in Fig. 4, is a ridge running with the strike of the apex of a flat vein. When I first saw it shaft No. 1 was apparently all in ore and there was a great scattering of carbonate ore all over the surface of the ridge down to the water courses on either side. Some of this ore assayed from 10 to 12 per cent. copper with some richer *nigger-heads* of copper minerals and hematite. The sinking of No. 2 shaft and the running of No. 3 tunnel followed by a more careful inspection of the bottom of No. 1 shaft demonstrated that the ore had a regular bottom or foot wall and formed merely the crest of the ridge *A*. The running of the tunnel No. 4 found the hanging wall and suggested a flat vein 22 ft. thick. When the owner gets another stake he will do some work on the dip and if this work shows the present conception of the vein to be correct, there will some day be big business doing on the Black Warrior.

Why the Ore Should Be Followed

Two partners opened the aggravating deposit shown in Fig. 5. At 40 ft. the pay streak went to one side of the shaft. Thinking it a mere aimless whim on the part of the pay ore, and that it would probably be strong enough to come back, they kept on down to water. At this point it struck them that it would be more sensible to follow the pay streak, which they then did, but when after several years, for it takes time when you haven't money to do work, they had followed this erratic vein 100 ft., after trending upward for some feet it abruptly turned down, until now they are in the water again. When you hoist water and haul it 100 ft. over an uneven course and then have to raise to the surface, you naturally pray for a dry year.

As it has been unusually dry this year they may be able to do this year's assessment work on shipping ore rich in gold, silver and copper, without being driven out by the water. But if it rains before they get started, it will be quite necessary to sink a new shaft at the bend to make a workable venture.

The Merry Widow vein illustrated in Fig. 6, shows how a high-grade orebody 60 ft. wide and worth many thousand dollars can dwindle down to 3 in. of poor quartz. This fact was not discovered until the lapse of 20 years from the first work, and until half a dozen persons had tried to find the downward continu-

ation. However, in sinking on this narrow streak, it was found to widen gradually and to get richer until now at 60 ft. below the surface ore there is 30 in. of shipping ore. The surface ore carried much silver and a little copper. The lower ore is good copper ore but the silver contents have decreased to 20 oz. or so. The country rock is andesite breccia and there are many veins in the neighborhood. The name by which the claim is now known is quite modern and as most of the ore was in the hat, is fitting enough. One old name was the Glass Bottle, another was the Church Porch: Why?

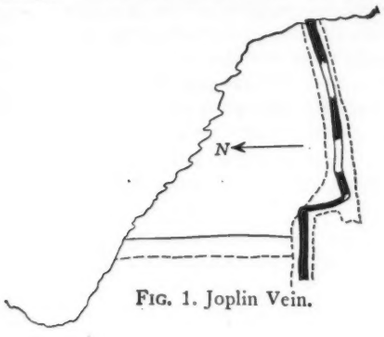


FIG. 1. Joplin Vein.

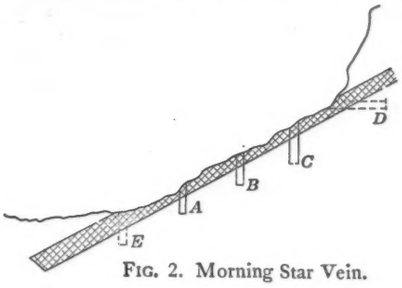


FIG. 2. Morning Star Vein.

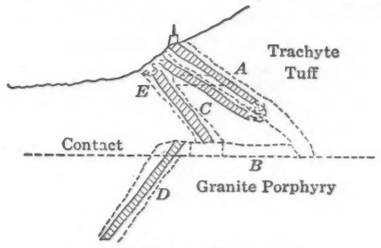


FIG. 3. A Puzzler.

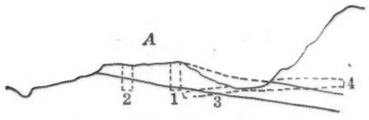


FIG. 4. Black Warrior.

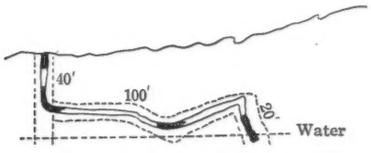


FIG. 5. P.F. Vein.

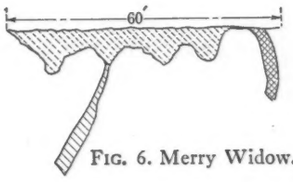


FIG. 6. Merry Widow.

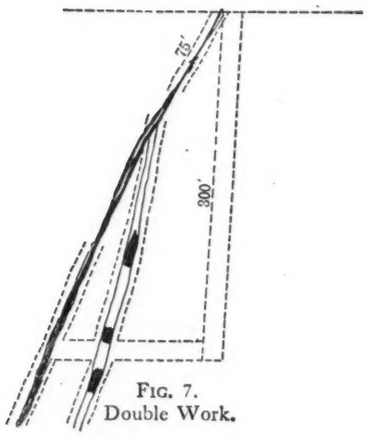


FIG. 7. Double Work.

FIG. 8. Jersey Girl Vein.

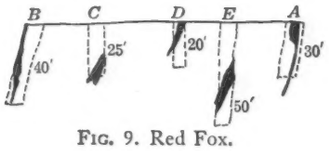


FIG. 9. Red Fox.

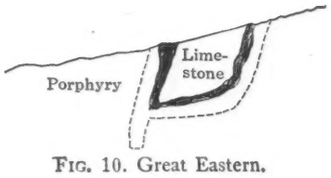


FIG. 10. Great Eastern.

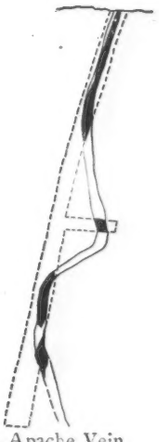


FIG. 11. Apache Vein.
The Engineering & Mining Journal

ERRATIC TYPES OF VEINS

HOW GOOD ORE WAS OVERLOOKED

In the case illustrated by Fig. 7, the owner sunk a 75-ft., shaft on the vein and then conceived the idea of a vertical shaft which he sunk to 300 ft. He then crosscut to the vein and on striking the first branch raised on it and sunk at same time, but although the upper work had been in rich ore it was not remunerative, so he quit discouraged and later sold the mine. The owner continued the raise and finally struck the main ore-shoot. He then came back and continued the crosscut at 300 ft., until he reached this shoot where he had good ore all around him. This shoot of ore gives promise of being 800 ft. long, 400 ft. high, about 2 ft. thick, and averaging in silver and lead more than $20 per ton. This example shows the danger of not "sticking to the ore" in prospecting work. The rock on both sides is trachyte and it is thought that the two branches unite further down.

The Jersey Girl, Fig. 8, is another case of wandering pay streak, about as crooked as far as it goes as the famous Little Jonnie. There was fine ore near the surface, a bunch still better at 80 ft. and just below the slip at about 100 ft. specimen ore. The owner believes in following the ore and has tried to do so, but this necessitated widening the shaft in places and at first he had working ladders on three sides of the shaft. The way the pay streak is diving at the bottom of the shaft renders his next work a close calculation of costs and requires good judgment as to the value of following the pay streak further. If this dip continues permanently it might be well but this is doubtful. The continuation of this work will be watched with interest, as it is a big vein and rich, and gives promise of a future. The rock is dacite breccia which may account for a crumpled vein and when the vein passes into the underlying rock it may be more regular.

THE PROBLEM OF A WIDE VEIN

The case of the Red Fox orebody is illustrated in Fig. 9. This is a vein running regularly enough but rendering its development a problem to a prospector with a couple of hundred dollars to buy food and mining suplies. The vein is from 75 to 125 ft. in width and averages over the length of the claim rather more than 100 ft. It consists of a great body of quartz carrying much manganese and iron (in a few places it is almost a good iron ore) and from 2 to 4 per cent. copper. It is ribbed with white quartz seams from 6 in. to 2 ft. thick which in places give way to good chalcopyrite ore assaying from 20 to 40 oz. silver and up to $5 in gold per ton. With the exception of these quartz seams, in all the places where the ore outcrops or where work

has been done, the vein is a homogeneous copper ore that is of no value whatever to the prospector without a partner with money to assist in developing the orebody in a large way. The owner believes that this great gossan covers a *bonanza* copper mine and if he manages to hold out long enough may prove it. So far, however, it has been love's labor. The shafts shown in the figure, be it understood, do not stand in a row across the vein, but at various places along the strike, yet in the respective positions shown. The country rock is granite porphyry.

Ore Enveloping Boulders

The prospector of the Great Eastern vein, Fig. 10, found an outcrop of good ore nearly 4 ft. wide between limestone and porphyry, located a claim and went to work on the ore. A few feet down the ore narrowed to 18 in. and was poorer so that he stopped work at that time, not resuming until the next year, when his work demonstrated that the ore was formed around a great boulder of limestone which had been caught up by the porphyry flow. This boulder had some ore formed on all five sides that were under ground. Some prospecting determined that there were many similar boulders, mostly of smaller size in the porphyry and that most of these had a little ore. He shows one limestone boulder about the size of a man's head with a thin coating of ore on two sides. This prospector takes the reasonable view that at some depth he will find the real contact and a rich deposit of ore. There is nothing further on the surface to serve as a guide. He has decided to get one edge of this porphyry and sink until he reaches the limestone in place, through which the porphyry made its way, according to this theory of it. What would you do?

From the Apache vein, illustrated in Fig. 11, ore worth from $1000 to $2000 per car has been shipped. The 400-ft. shaft shows the vein to be irregular and the immediate problem is whether to sink further, in which case a new equipment for deep work will be necessary, or to crosscut from the bottom of the shaft to cut the vein which is supposed to be repeating the curve known to occur above. This is similar to the case of the Joplin vein above cited and is probably a simple slip. As in the Joplin, the ore is at its best below the slip which evidently retarded the circulation leading to increased deposition. There is no evidence in either of these cases that is conclusive as to whether this slip fades out along the strike, but further work may give this information. The country rock is possibly a granite but has been generally called diorite by the prospectors and in the immediate vicinity there are outcrops of thin beds formerly covering the area.

Mine Ventilation on the Rand

By Frederick H. Hatch

In the early days of the Rand, and, indeed, up to quite recently, it was not found necessary to employ any artificial system of ventilation, the numerous shafts and outlets to the surface of the outcrop mines having sufficed to maintain an ample supply of fresh air. But with deeper levels (the Village Deep mine is already working at a vertical depth of 4000 ft.), fewer communications with the surface, and an increased rock temperature, artificial ventilation is destined to play an increasingly important part. Stuart Martin[1] gives it as his opinion that it will be impossible to work the deep levels economically without carefully thought-out schemes of ventilation; and that for the success of these, it will be necessary to have shafts with small frictional resistance and large air space, and to carry the air current through special ventilating roads.

The quantity of pure air to be supplied per minute, per man employed underground, is fixed by law at 70 cu.ft. This being a standard difficult to enforce, the South African Mining Regulations Commission, whose report was published in 1910, proposes as a substitute, the quality standard based on a maximum of 20 parts by volume of carbon dioxide per 10,000 parts of air. Of this, four parts is an allowance for the CO_2 normally present in the atmosphere; three parts are allowed for the CO_2 produced by the burning of candles, and there is a further allowance of five parts for the CO_2 possibly given off from the country rock, leaving eight parts per 10,000 as a legal limit for the noxious CO_2 due to the vitiation of the air by blasting, human emanations, etc. Under the proposed regulations provision is to be made at each mine for a permanently up-cast and a permanently down-cast shaft, by the use of ventilating fans, or otherwise; and the current of fresh air so produced is to be split by regulating doors at every level where work is carried on, in proportion to its requirements. Further, the courses of pure supply and foul return are to be kept distinct by bratticing, and short circuiting is to be prevented by stopping disused drives, stopes, etc.

The ventilation problem has already been seriously attacked on the Rand, and already ventilating fans, varying in capacity from 50,000 cu.ft. per min., at 1-in. water gage, to 250,000 cu.ft., at 4-in. water gage, have been installed at the East Rand Proprietary mines, at the Simmer Deep, at the Village Deep, at the Langlaagte Royal Shaft of the Crown mines, and at several other mines of the Eckstein Rand mines group. In splitting the air current the numerous dikes of igneous rock that traverse the Witwatersrand mines in a north and south direction (i.e., across the strike) can be made to serve as natural brattices, since they cut up the mines into air-tight compartments. The levels that penetrate these dikes must be permanently closed, or, if used for tramming, closed by double swinging doors.

The ventilation of the mines is hampered by the small air space and large frictional resistance of the rectangular timbered shafts at present in use on the Rand. For this reason many of the deeper shafts of the future will, no doubt, be of the circular type, with either brick or concrete lining, as is the common practice in the collieries of South Africa. Already a large circular shaft is being sunk at the New Modderfontein mine.

Main levels and underground inclined shafts will also be driven in the foot wall. These will serve as intakes for the air current, and, being in solid ground, will reduce the loss of air by short-circuiting to a minimum. Since these main ventilating roads, instead of following the regular course of the reef plane, are driven straight, they will be admirably adapted for cheap mechanical transport.

Note—Extract from the "James Forrest" lecture, 1911, before the Institution of Civil Engineers, entitled "The Past, Present and Future of the Gold Mining Industry of the Witwatersrand, Transvaal."

[1] *Journ.* Chem., Met. and Min. Soc., S. A., Vol. XI, 1910, p. 214.

Cooling Mines Artificially

In order to obviate the many economic and sanitary disadvantages connected with the increasing hight of the temperature in depths below 1000 or 1200 m., Messrs. Rosenbeck and Rath advocate, in a recent issue of *Gluckauf*, the installation of freezing apparatus similar to those which have been so successfully introduced, especially in tropic climes, in hospitals, slaughter-houses, theaters, market halls, etc. As specially suitable for erection underground, they recommend evaporation plants with compression pumps, the most suitable freezing agent being sulphurous acid. The plant would have to be erected in a specially constructed cooling chamber on the level it is to serve. From this chamber the cold air would be conducted to the working faces by pipes, which would, by passing through drives and crosscuts, cool the air in them as well. Although the cost of an installation sufficiently powerful to cool a mine section worked by shifts of 60 men each would amount to about $3870, and the working costs, inclusive of interest and sinking fund, to $5600 per annum, the authors arrive at the conclusion—which they substantiate by a series of careful calculations—that, quite apart from its sanitary advantages, the economic results achieved by such an installation in increasing the working capacity of the men, etc., would not only fully cover all expenses, but leave a profit.

Standard Electric Practice at Mines

An abstract of the rules prepared by the American Mining Congress governing the use of electricity in mines.

A committee of the American Mining Congress was appointed in 1909 to draw up a form of law governing and standardizing the use of electricity in mines, which might serve as a basis for legislation by the several States, under whose jurisdiction matters of this nature must ultimately come. The committee made a preliminary report of progress, and then practically turned over the subject[1] to the Bureau of Standards, of the Department of Commerce and Labor, under whose auspices the recommendations, accompanied by a discussion of the problems and by abstracts from the extant State and other laws, have recently been published in *Circular No. 23.* The proposed law may be briefly abstracted as follows:

Definitions. "Pressure" is the word used to mean difference of potential. "Low pressure" does not exceed 300 volts; "medium pressure," 300 to 600 volts; "high pressure," above 600 volts.

Section 1. This includes 10 general rules covering precautions to be observed in the installing and use of conductors and motors for underground work. The armor of cables, the bed plates of motors, etc., and the coverings of switches and circuit-breakers are to be grounded. High pressure is not to be used underground, except in alternating current, or to supply transformers, and all transmission lines are to be labeled at intervals, with a statement of the voltage carried. Insulation is to be measured every three months, and any leakage amounting to 0.001 of the maximum working current in a cable is to be investigated and repaired at once. For work of this character, the employment of a mine electrician, and, if necessary, an assistant electrician, is made compulsory; these electricians are to be examined and licensed by the State. A map of the distribution system of every mine is to be prepared and filed, and instructions for resuscitating persons overcome by electric shock are to be posted. Accidents are to be promptly reported, and all unauthorized persons are prohibited from making alterations in the wiring system.

Installing of Transmission Lines

Section 2. This comprises 13 rules governing the design and installing of cables and transmission lines. If the generating station is more than 1000 ft. from the mine entrance, properly protected switches must be placed near the entrance; current for the operation of man hoists and ventilating fans must be supplied through feeders separate from the rest of the equipment. An overhead line more than 400 ft. long must be supplied with lightning arresters; high-pressure lines must be hung at least 20 ft., and all other lines at least 6½ ft., above the ground. High-pressure lines underground must be lead covered, but medium- and low-pressure lines in non-gaseous mines may be bare. Terminals and joints are to be insulated with tape or other means. Cables in shafts are to be strongly supported, but with sufficient flexibility to prevent breakage if they are struck. Trailing cables for driving coal cutters are required to be of exceptional strength and flexibility, and the two component wires are to be clamped together to the motor in such a way as to avoid all tension strains at the pole connections. Trolley wires in underground roadways must be kept as close as possible to one side, and in all traveling roads all wires except signal wires must always be placed on the same side of the road. Branch trolleys are to be supplied with automatic switches to cut off the current when not in use. Red signal lights are to be arranged to burn when the current is on. Lighting and signal wires are to be carefully insulated.

Section 3. This includes three rules for switches, fuses and circuit-breakers. Fuses and breakers are to be designed to yield at 100 per cent. overload. Fuses are to be stamped or marked with the current at which they are designed to melt. The bases of switches and breakers must be of marble or other incombustible material, and should be placed in as dry a situation as possible. Temporary connections must not be made without first cutting off the current from the main wires.

Rules for Coal Cutters

Section 4. Four rules of this section refer to motors, and require that only experienced workmen shall be put in charge of coal cutters; that a cutter shall not be kept in operation for more than half an hour continuously (to allow for careful examination of the roof); and that the operator shall not leave his machine while it is running. Three rules govern the use of electricity for shot firing, and demand that switches connecting the firing circuit with power or lighting mains shall be under lock and key; also that no shots shall be fired by such means until all men are out of the mine, and then only by an authorized person. In the use of portable dynamos for firing, a removable plug, which shall always be in the custody of the shot firer, is prescribed for closing the circuit; furthermore, the leading wires must not be connected to the dynamo until all preparations are complete, and they are to be disconnected immediately after the shot. Rule 35 of this section requires that telephones shall be installed in every mine opened by shaft only, or in a drift mine having workings more than one mile from the entrance, if the regular working force exceeds 25 men at one time. In a mine employing more than 100 men at a time, the telephone wires, if possible, shall be introduced through drill holes, so as to reduce danger of interference by falls or explosions.

Section 5. This comprises 19 rules covering the much debated use of electricity in gaseous coal mines, and seems to have been formulated so as to allow ample margin of safety. No electric current whatever is to be allowed for 24 hours in such part of a mine as contains enough explosive gas to be detected by a safety lamp. In a mine or part of a mine in which gas is so abundant as to necessitate the use of locked safety lamps, special and additional precautions are stipulated, of which the following may be specially noted: (*A*) Whenever ventilation is interrupted for a period of over 15 min., all direct-current motors not equipped with explosion-proof casings shall be switched off, and not put into operation again until ventilation is resumed and the mine is free from gas; motors driving ventilating fans and man hoists are excepted from this provision. (*B*) No pressure higher than medium shall be used, and only signal wires are permitted to be bare. (*C*) The official electrician shall be constantly on duty as long as the consumption of power exceeds 25 h. p. (*D*) Main cables shall be laid in the intake airway only, or through special and separate passageways which shall always be free from gas. (*E*) Makeshift connections are prohibited, and all switches must be inclosed in explosion-proof cases, or break under oil. (*F*) Explosion-proof cases, specially designed to withstand the force of an internal explosion of gas and to cool the

[1]There seems to have been some misunderstanding about this matter, the same, or another, committee of the American Mining Congress having gone ahead and made a report, which was published subsequent to the issuance of the report of the Bureau of Standards. However, the causes leading up to this duplication of investigation, or any feelings of jealously or pique (if such exist) resulting therefrom, are of no great consequence.—Editor.

escaping products of such an explosion, are required on all direct-current motors, unless situated in an intake airway. (*G*) Before bringing an electric coal cutter within 20 yd. of the working face in a gaseous mine, inspection for gas shall be made with safety lamp or other means, and similar inspections are to be repeated at intervals of 30 min.; if gas is found, the power must be disconnected at once. (*H*) On the appearance of arcs outside the motor casings, the machine must be stopped forthwith, and the defect repaired; all inclosed motors are to be opened and inspected once a week, and cleaned if necessary. (*I*) Where safety lamps are necessary, motor haulage by the trolley system is prohibited; storage battery locomotives may be used, under the regulations applying to other motors. (*J*) Electric lamps are to be inclosed in gas-tight globes, and installed without flexible cords; electric relighters for safety lamps shall be maintained in one definite place, selected for its freedom from gas, and shall be kept under lock and key. (*K*) All conductors shall be designed in accordance with the requirements of the *National Electric Code*.

Section 6. This section of the proposed law provides in careful detail for the inspection of electrical equipment, for the appointment of a board of examiners who shall examine and appoint the necessary number of mine inspectors, and mine electricians, and for the legal routine to be followed in enforcing the requirements of the act, in removing inspectors, and in convictions for violations of the law. Without going into the details of this section, its provisions seem to have been designed with admirable fairness, and with the constant aim of protecting the lives of miners. The mine inspectors are selected by competitive examination, the scope of which is to be such as to put a premium on the candidates' practical experience, while demanding also a thorough scientific knowledge. The salary of inspectors, $3000 per year for six years and thereafter $3500, with ample allowance for expenses, seems sufficient to attract well qualified men.

The committee accompanies its proposed draft of laws with copious notes supporting its conclusions; these are compiled in *Chapter III* of the present volume, and make exceedingly interesting and instructive reading. *Chapter IV* treats of the dangers of electric wires and how to avoid them, referring especially to the particular environments observed in and around mines. *Chapter V*, concluding the present volume, contains abstracts from the laws bearing on the subject enacted in West Virginia, Ohio, Pennsylvania, and others of the United States, and in Great Britain, Belgium and New South Wales.

Charges For Reconsigning Coal

WASHINGTON CORRESPONDENCE

In a decision recently handed down by the Interstate Commerce Commission in the case of the Detroit Traffic Association vs. the Lake Shore & Michigan Southern Railway Company, the question of reconsignment charges on cars used in shipping bituminous coal is dealt with, and in this particular case a charge of $3 per car at Detroit, Mich., on coal originating at points in Ohio and elsewhere and forwarded to various Michigan points is found unreasonable, and a charge of $2 is prescribed for the future.

The commission says that the consignment privilege has grown in response to changes that have taken place in commercial adjustments. Formerly the large distributing centers of the country were the depots in which supplies were stored by jobbers, but with the spread of transportation and population, shipments have gone more directly to the consumer, so that in many lines the jobber is really a broker who directs distribution without directly handling the goods. Reconsignment is a privilege extended by carriers to shippers, under which goods may be forwarded to some point other than their original destination without removal from the car, and at the through rate from the initial point to that of final delivery. This use of the through rate is what differentiates the reconsignment from reshipment. Speaking of coal specifically, the commission says:

"In the handling of coal the greatest difficulty to be overcome arises from the irregularity of demand. There is a certain degree of steadiness in the demand for manufacturing purposes, but the domestic demand is comparatively quiescent through the warm months, while, as winter approaches, this demand becomes suddenly intense in every village and hamlet throughout the land. The leader in a small community who handles but a limited number of cars of coal each year, usually has a small capital and is not prepared to tie up any part of that capital in holding coal to insure meeting a prospective demand. . . . . To the consumer reconsignment means not merely regularity and timeliness of supply, but economy in securing that supply."

Speaking of the cost of consignment at Detroit, the commission gives some interesting data, saying:

"The superintendent of terminals of the Michigan Central at Detroit testified that the expense of the extra movement involved in reconsignment was $1, one-half of this being for placing on the hold track and one-half for removing and placing on the delivery track. To this he added $1.05 for per day on the car for three days at 35c., making the total expense of the movement $2.05. Reconsignment also involves a certain amount of clerical work in the issuing of a new waybill and the figuring of the new division of the rate among the participating carriers. None of the witnesses was prepared to estimate the expense of this clerical work. . . . . We may accept the estimate of $1 for the movement of the car as fairly reasonable if we allow one-third for moving to the hold track, and two-thirds for the reverse movement. The per diem for the detention of the car for two days would increase this by 70c. The clerical work remains to be considered. Evidence places the clerical expense on each bill at between 3 and 4c. Allowing 5c. for this work and 25c. for profit on the entire movement, we have a rate of $2, which is the same as that charged south of the Baltimore & Ohio line."

International Nickel Company

The sixth annual report of the International Nickel Company for the year ended March 31, 1911, states that the demand for the company's products for the last fiscal year was the greatest in the company's history, due largely to the growth of the motor-vehicle business, and that the Monel metal trade is still being developed.

Few technical details are given, these consisting of information that a 70-ton basic converter has replaced three acid-lined at Copper Cliff, and that results were so good that three more basic converters will immediately be installed, and that acid converting will be abandoned; and that reverberatory smelting of fine ore and flue dust has been taken up.

The company paid 6 per cent. dividends on its preferred stock, and 7 on the common, following an extra 25 per cent. dividend on the common stock. Following the lead of many other corporations, the International Nickel Company is now carrying its own industrial insurance, and is preparing to take over its fire insurance, being engaged in building up a fund for this purpose.

The investments in constitutent companies and in plant are now valued at $27,262,138, and cash resou .es amount to $2,852,102. The total net profits for the year amounted to $3,775,600, after allowing for depreciation, exhaustion of mines and bond sinking fund.

New Zealand Mineral Production

Official statistics for 1909, which are the latest figures available, show that during that year New Zealand produced 506,371 oz. of gold; 1,813,830 oz. of silver, and 1,911,247 tons of coal. A small amount of the gold is obtained from alluvial diggings, but the greatest quantity is taken from gold-bearing quartz. No other metals, besides gold and silver, were produced on a commercial scale.

British Patent Fuel Industry

The manufacture of coal briquets or patent fuel has been thoroughly established at Swansea for a number of years and is closely connected with the trade of the port. According to Consul C. Ludlow Livingston[1], there are more patent-fuel works in Swansea than in any other industrial center of the United Kingdom. There are six modern works there, the combined annual output of which averages about 650,000 tons, although their capacity is easily double that quantity. Practically the whole output is exported, the best customers being the European and South American railways. Large quantities are shipped regularly to Algeria, Egypt, Mexico, South America and the West Indies.

The successful manufacture of briquets depends on the skill with which the various classes of coal dust are utilized. The coal dust used is from anthracite, steam and bituminous coal. The plan in mixing is to secure a blende which, when combined with coal-tar pitch as a "binder," will emit the least possible smoke when burning and retain good steam or heat-producing qualities. By various blendings of coal dust, briquets can be produced to supplant steam coal or common house coal, according to requirements. Many experiments have been tried to make a successful smokeless briquet or a substitute for anthracite coal. Many processes have been tried and patented, but have not been successful. Practically $500,000 has been lost in such local experiments.

It is easy to produce a practically smokeless briquet by using glucose, rice flour or cornmeal for binder, instead of coal-tar pitch, but when exposed to the atmosphere it absorbs moisture which overcomes the binder and the briquet crumbles into dust. A new briquet has recently been put on the market, though its utility is as yet in an experimental state. This new fuel is composed roughly as follows:

Anthracite dust, 65 per cent.; bituminous dust, 30 per cent.; cornmeal, 4 per cent.; coal-tar pitch, 1 per cent. The manufacturers claim that the 1 per cent. of coal-tar pitch is sufficient to make the product waterproof, but this is doubted if the fuel is to be shipped and subjected to climatic changes. However, when fresh, the fuel produces a bright and hot fire.

Patent-fuel briquets are made in two sizes. The smaller ones weighing about 4 oz. are used in open fireplaces as a substitute for common, bituminous house coal, and the larger briquets, varying in weight from 5 to 9 lb., are generally used in locomotives. The coal-tar pitch binder often controls the selling price of the finished article. The demand for tar to spray roads has increased the price of pitch in the last few years.

The process of manufacturing briquets is as follows: The coal dust is mixed with lumps of pitch in a disintegrator, which combines the two ingredients, steam being introduced to make the pitch adhesive; the mixture then passes into molds and is pressed together, the pressure being about 20 lb. per sq.in. The blocks are then cooled by fans and the briquets are completed. The ordinary size is about double a common building brick and the weight is 10 pounds.

From investigations of the briquetting industry the following conclusions are deduced: The so-called patent fuels, making use of glucose, cornmeal, starch, etc., are not successful, as they will not remain intact when continuously exposed to atmospheric moisture. Pitch is the only binder in successful use, but it increases the smoke produced in burning the fuel.

To compete successfully with coal, manufacturers of briquets must have access to a cheap coal supply not suitable for the market in its natural state. The most successful makers have their own mines, and utilize in briquets the slack and fine coal for which there is no market.

During 1909, in England, Ireland, Scotland and Wales, 1,511,645 tons of briquets were produced, 1,410,150 tons of coal dust being used.

[1]*Daily Consular and Trade Reports*, Aug. 4, 1911.

A Self Burning Limestone

While making a trip through Hauran, a volcanic district of Syria, south of Damascus, John D. Whiting observed a peculiar self-burning limestone.[1] The rock lay in a stratum between ordinary limestone; it was of a grayish-black color, and when freshly broken had an odor of petroleum. Near by were outcrops of what looked like the same material many rods long and 20 to 30 ft. thick.

The quarrying is easily done with primitive picks and other tools, as the rock is soft and full of seams. The stone is broken into small pieces with hammers and piled up against the bank of rock. A wall of the same material about two feet high is roughly laid up around the pile on three sides, making a pile of small stone eight to 10 ft. long and nearly as wide, and two feet at the front, rising to nearly three times that hight at the back where it lies against the bank.

In building the wall around the pile small holes are left for draft and in which to start the fire. When the kiln is ready to burn, a few small bunches of straw are placed in the holes mentioned, lighted with a flint and steel, and in a short time the whole pile has ignited. The men then begin working on a new kiln while the other burns and cools.

After about 12 hours of burning the stone has all become converted into lime, except the stones in the wall and the top layer, which are only about half burned. When cool the lime is air-slacked and sifted to remove any pieces not thoroughly burned, which are thrown into a new pile to be fired again.

The lime is white and said to make a strong plaster, superior to the ordinary lime burned with brush, but it sells at a lower figure because of the low cost of production. In this district much lime is made in this way, and in places many gangs of men could be seen working at it, which tended to convince one of the quantity of this material which must exist. This stone is so situated that, should it prove to be of commercial value, it could be easily transported.

[1]*Daily Cons. and Trade Reports*, July 21, 1911.

State to Operate Banner, Ala., Mine

BIRMINGHAM CORRESPONDENCE

The State of Alabama has leased the Banner mines from the Pratt Consolidated Coal Company, and commencing Nov. 15 will take up the operation of the mines, using 400 State convicts. The Pratt company will remove its 200 county convicts to mines at Flat Creek, where a prison will be built. The State leases the Banner mines with the expectation of earning more money with the convicts. The Pratt Consolidated Coal Company will buy all the coal mined by the State. The object on the part of the company is to get a better production at the Banner mines than at present, the mines being among the best equipped in the State. While there has been some comment on the leasing by the State of coal mines and entering the coal business, the convict board expects to show better results with the convicts.

Maryland's 1910 Coal Production

The production of coal in Maryland in 1910 was 5,217,125 tons, according to statistics collected by the U. S. Geological Survey in coöperation with the Maryland Geological Survey. Maryland benefited indirectly from the six months' strike among the miners in the Central or Mississippi Valley States.

The coal production, which, because of the approaching exhaustion of the famous "Big vein," had been showing a declining tendency for the last two years, was given an impetus by the trade conditions in 1910 and increased from that of 1909 by 1,193,884 tons, or 29.67 per cent.

The Mining Index

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print), in the original language, for the price quoted. Where no price is quoted, the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

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16,428—NEVADA—Notes on the Economic Geology of the Ramsey, Talapoosa, and White Horse Mining Districts, in Lyon and Washoe Counties, Nevada. J. M. Hill. (U. S. Geol. Surv., Bull. 470-B, 1911; 10 pp.)

16,429—NEW MEXICO—The Ore Deposits Near Pinos Altos, New Mexico. Sidney Paige. (U. S. Geol. Surv., Bull. 470-B, 1911; 22 pp., illus.)

16,430—QUEBEC—Geological Reconnaissance along the Line of the National Transcontinental Railway in Western Quebec. W. J. Wilson. (Can. Dept. of Mines, Geol. Surv. Branch, Memoir 4, 1910; 56 pp., illus.)

16,431—SWEDEN AND NEW YORK—Comparative Sketch of the Precambric Geology of Sweden and New York. J. F. Kemp. (N. Y. State Museum, Bull. 149, 1910; 14 pp.)

16,432—TASMANIA—Scamander Mineral District. W. H. Twelvetrees. (Tasmania Geol. Surv., Bull. 9, 1911; 62 pp., illus.)

MINING—GENERAL

16,433—ALASKA — A Trip to Kodiak Island. C. O'Brien. (Min. and Met. Journ., Aug., 1911; 2 pp.) 20c.

16,434—COLORADO—Geological Advice to Colorado Prospectors. Arthur Lakes. (Min. Sci., June 22, 1911; 3¾ pp., illus.) 20c.

16,435—DAMS—Notes on Hydraulic-Fill Earth Dams. John M. Nicol. (Informes y Memorias del Inst. Mex. de Minas y Metalurgia, Año II, No. 3, 1910-1911; 17 pp., illus.)

16,436—DRILLING—The Modification of Mining Methods by Electrical Machinery. R. W. Hutchinson, Jr. (Eng. Mag., July, 1911; 6 pp., illus.) 40c.

16,437—EARTHQUAKES, Strains and Stresses in Relation to Mine Explosions. F. Napier Denison. (Bull., Can. Min. Inst., Apr., 1911; 9 pp.)

16,438—EARTHQUAKES in Mines. James Douglas. (Bull. Can. Min. Inst., Apr., 1911; 7 pp.)

16,439—ELECTRIC POWER—Electrified Mining. A. L. Sweetser. (Mex. Min. Journ., Aug., 1911; 1¾ pp.) 20c.

16,440—ELECTRICAL SECTION of the Bureau of Mines, Its Purposes and Equipment. H. H. Clark. (Bureau of Mines, Tech. Paper 4, 1911; 12 pp.)

16,441—ELECTRICITY — Application of Electricity to Rand Operations. Rowland Gascoyne. (Min. and Eng. Wld., July 22, and Aug. 5, 1911; 5 pp., illus.) 40c.

16,442—ELECTRICITY in Mining. Walter C. Wagner. (Mines and Minerals, July, 1911; 3 pp., illus.) 40c.

16,443—ELECTRICITY—The Modification of Mining Methods by Electrical Machinery. Rollin W. Hutchinson, Jr. (Eng. Mag., Aug., 1911; 14½ pp., illus.) 40c.

16,444—EXAMINATION of Workings of Developed Mines. William Crosley. (Mex. Min. Journ., July and Aug., 1911; 12 pp., illus.) 40c.

16,445—EXPLOSIVES—Experiments on the Variations of the Charge-Limits of Explosives. (Colliery Guardian, June 21, 1911; 1¾ pp., illus.) 40c.

16,446—EXPLOSIVES—Firing Ammonium Nitrate Explosives. (Mines and Minerals, July, 1911; 1½ pp.) 40c.

16,447—GAS—Gasvorkommen in Kalisalzbergwerken. Scheerer. (Preus. Zeit. f. B. H. u. S., Vol. 59, Part 2, 17 pp.) Occurrence of gas in potash-salt mines.

16,448 — HOISTING — The Driving of Winding Engines by Induction Motors. (Iron and Coal Tr. Rev., May 19, 1911; 2 pp., illus.) Paper before Institution of Elec. Engrs. 40c.

16,449—HONDURAS—Notes on Honduras. H. P. Boyce. (Min. and Met. Journ., Aug., 1911; 1 p., illus.) 20c.

16,450—HYGIENE—Die Einwirkung des Klimas in Bergwerken auf die Bergarbeiter. Hanauer. (Bergbau, July 21, 1911; ¾ p.) The influence of climate in mines on mine employees.

16,451—JAPAN—Japans Bergbau früher und jetzt. Abstract from "Mining in Japan, Past and Present." Striebeck. (Preus. Zeit. f. B. H. u. S., Vol. 59, Part 2, 30 pp., illus.) Mining in Japan, past and present.

16,452—LAW—The New Illinois Mining Law. (Mines and Minerals, July, 1911; 2¼ pp.) 40c.

16,453—MAPS—Filling in Maps. Edwin A. Sperry. (Min. and Sci. Press, Aug. 5, 1911; 2½ pp., illus.) 20c.

16,454—MANICALAND—A Year of Manicaland Mining—I. (South African Min. Journ., July 8, 1911; 1¼ pp.) 40c.

16,455—MEXICO—Hints on Travel in Mexico. G. L. Sheldon. (Min. and Sci. Press, Aug. 5, 1911; 1½ pp.) 20c.

16,456—MINE SUPPORT TESTS. (Mines and Minerals, July, 1911; 2½ pp., illus.) 40c.

16,457—NICARAUGUA—Engineering Problems in Nicaragua. T. Lane Carter. (Eng. Mag., Aug., 1911; 9¼ pp., illus.) 40c.

16,458—PERU—A Sketch of the Mining Industry in Peru. F. E. Ross. (Mex. Min. Journ., Aug., 1911; 3 pp., illus.) 20c.

16,459—PRESSURE—Le Calcul des Pressions Communiquées par des dépots de Matières Solides en Menus Morceaux. S. Hanappe. (Revue Universelle des Mines, de la Métallurgie, Feb. and Mar., 1911; 52 pp., illus.) Theoretical and experimental discussion of the pressures exerted by a body of broken ore as in a bin.

16,460—QUARRYING Methods at Berkeley, California. William H. Storms. (Min. and Met. Journ., Aug., 1911; 2 pp., illus.) 20c.

16,461—QUEBEC MINING LAW—Mining Rights in Seigniories in the Province of Quebec. T. C. Denis. (Bull., Can. Min. Inst., Apr., 1911; 5 pp.)

16,462—RESCUE APPARATUS—A New Breathing Apparatus. (Mines and Minerals, July, 1911; 1 p., illus.) 40c.

16,463—RESCUE APPARATUS—The Use and Care of Mine-Rescue Breathing Apparatus. James W. Paul. (U. S. Bureau of Mines, Miners' Circular 4, 1911; 24 pp., illus.)

16,464—RHODESIA — The Metalliferous Ores of Rhodesia. A. E. Zealley. (South African Min. Journ., July 8, 1911; 1¼ pp.) A brief record of gold, copper and other mineral resources. To be continued. 40c.

16,465—SAND FILLING—Ueber die Oberschlesien beim Abbau mit Spülversatz beobachteten Erdsenkungen. Buntzel. (Preus. Zeit. f. B. H. u. S., Vol. 59, Part 2; 40 pp., illus.) On the sagging of the surface ground observed in mining with sand filling in Upper Silesia.

16,466—STOPING—Desirable Method of Stoping a Flat Vein. William H. Storms. (Min. and Eng. Wld., Aug. 12, 1911; 1 1/3 pp., illus.) 20c.

16,467—SURVEYING — Azimuth Determinations without an Ephemeris. G. N. Pfeiffer. (Min. and Sci. Press, July 22, 1911; 1 p., illus.) 20c.

16,468—SURVEYING—Triangulation Applied to Mines. E. E. Barker. (Min. and Sci. Press, June 24, 1911; 3 pp., illus.) 20c.

16,469—TASMANIA—The Progress of the Mineral Industry of Tasmania for the Quarter Ending March 31, 1911. (Compiled by W. H. Wallace, Secy. for Mines, Hobart, Tasmania, 1911; 12 pp.)

16,470 — TIMBERING — Eckstück oder Gleitschuh für nachgiebigen Grubenausbau. (Bergbau, July 6, 1911; 2 pp., illus.) Corner piece or sliding shoulder for posts in yielding mine timbers.

16,471—TIMBERING — Mine Bulkheads. William H. Storms. (Min. and Sci. Press, July 22, 1911; 1 p.) 20c.

16,472—UNWATERING El Cobre Mines by Air Lift. E. H. Emerson. (School of Mines Quart., July, 1911; 3 pp.) 60c.

16,473—VALUATION—The Estimation and Valuation of Ore Reserves. Communication by William Crosley on G. A. Denny's paper. (Informes y Memorias del Inst. Mex. de Minas y Metalurgia, Año, II, No. 3, 1910-1911; 3 pp.)

16,474—VENTILATION—Mine Ventilation. F. Ernest Brackett. (Mex. Min. Journ., Aug., 1911; 6½ pp., illus.) 20c.

16,475—VENTILATION—Some Aspects of Mine Ventilation and Temperatures on the Witwatersrand. J. Whitehouse and W. L. Wotherspoon. (Journ. Chem., Met. and Min. Soc. of South Africa, May, 1911; 16 pp., illus.) 60c.

ORE DRESSING—GENERAL

16,476—BALL-MILL PRACTICE at Kalgoorlie. M. H. von Bernewitz. (Min. and Sci. Press, July 15, 1911; 3½ pp., illus.) 20c.

16,477—CONCENTRATOR — A Modern Type Concentrator in Gilpin County. Charles J. Downey. (Min. Sci., July 20, 1911; 3¼ pp., illus.) 20c.

16,478 — MAGNETIC SEPARATION — Nassmagnetische Aufbereitungschwach magnetischer Erze. (Stahl u. Eisen, July 13, 1911; 2½ pp., illus.) Wet magnetic dressing of slightly magnetic ores. 40c.

16,479—MAGNETIC SEPARATION OF ORES. Lucius L. Wittich. (Mines and Minerals, Aug., 1911; 2 pp., illus.) A description of the process as used in mills at Joplin, Mo., and Galena, Ill. 40c.

METALLURGY—GENERAL

16,480—CORROSION—Report to the Corrosion Committee of the Institute of Metals. Guy D. Bengough. (Engineering, Jan. 20, 1911; 3 2/3 pp., illus.) 40c.

16,481—ELECTRIC FURNACES for Treatment of Zinc Ores. J. H. Lawrie. (Min. and Eng. Wld., Aug. 12, 1911; 2 1/3 pp., illus.) 20c.

16,482—PYROMETRY of Continuous Furnaces. Charles E. Foster. (Mechan. Engr., June 16, 1911; 2 pp., illus.) 40c.

16,483—SMELTER SMOKE—Dissipation of Smelter Smoke. W. L. Austin. (Mines and Methods, July, 1911; 1 2/3 pp., illus.) 20c.

16,484—SMELTER SMOKE—The Electrical Precipitation of Suspended Particles. F. G. Cottrell. (Journ. Ind. and Eng. Chem., Aug., 1911; 18 pp., illus.) 80c.

MINING AND METALLURGICAL MACHINERY

16,485—AERIAL TRAMWAYS of the Balaklala Consolidated Copper Company. William Hewitt. (Cassier's Mag., Aug., 1911; 6 pp., illus.) 40c.

16,486—BELT CONVEYERS. J. H. Oates. (Mex. Min. Journ., Aug., 1911; 1 p., illus.) 20c.

16,487—COMPRESSED-AIR CYLINDERS—A System of Soapy Water Lubrication for Air Cylinders. (Journ. South African Inst. of Engrs., July, 1911; 2½ pp.) 60c.

16,488 — COMPRESSED-AIR LOCOMOTIVES—La Traction Souterraine par Locomotives a Air Comprimé aux Mines d'Anzin. M. O. Pelabon. (Bull. et Comptes Rendus Mensuels de la Société de l'Industrie Minérale, May, 1911; 21 pp., illus.) Compressed-air locomotives in the Anzin coal mines.

16,489—DREDGE—Die Torfgewinnungsmaschine, Bauart Strenge. Paulmann und Blaum. (Zeit. des Vereines Deutsch. Ing., June 17, 1911; 5 pp., illus.) The Strenge peat-dredging machine.

16,490—ELECTRIC EQUIPMENT — The Electrification of the Randfontein Central. T. P. E. Butt. (Journ. South African Inst. of Engrs., June, 1911; 44 pp., illus.) $1.

16,491—ELECTRIC FURNACE—The Ruthenberg Electric Furnace. (Iron and Coal Tr. Rev., May 5, 1911; 1 p., illus.) 40c.

16,492—EQUIPMENT of the Poverty Gulch Mine. (Mines and Minerals, Aug., 1911; 2¼ pp., illus.) 20c.

SAMPLING AND ASSAYING—GENERAL

16,493—AGITATOR for Determinations of Silver, Phosphorus and Magnesia. L. W. Bahney. (Journ. Ind. and Eng. Chem., Aug., 1911; 1 p., illus.) 60c.

16,494—CEMENT—A Scheme for the Rapid Analysis of Cement. Clarence N. Wiley and W. A. Ernst. (Journ. Ind. and Eng. Chem., Aug., 1911; 1½ pp.) 60c.

16,495—CERIUM—A New Method for the Separation of Cerium. C. James and L. A. Pratt. (Journ. Am. Chem. Soc., Aug., 1911; 3¾ pp.)

16,496—FURNACE GASES — Apparatus and Methods for the Sampling and Analysis of Furnace Gases. J. C. W. Frazer and E. J. Hoffman. (Bureau of Mines, Bull. 12, 1911; 22 pp.)

16,497—GAS ANALYSIS—The Methods of the United States Steel Corporation for the Technical Sampling and Analysis of Gases. J. M. Camp. (Chem. and Met. Eng., June and July, 1911; 9 pp., illus.) 80c.

16,498—LEAD IN ALLOYS—Determination of Lead in Alloys Containing Antimony and Tin. A. G. Blakeley and E. M. Chance. (Journ. Soc. Chem. Ind., May 15, 1911; 1¼ pp.)

16,499—MACHINE SAMPLING—Studium über das Probenehmen von Erzen mit Maschinen. Bender. (Zeit. f. angew. Chem., June 23, 1911; 2 pp., illus.) Studies on the sampling of ores by machinery; from American sources. 40c.

16,500—MINE SAMPLING—A Problem in Mine Sampling. T. Lane Carter. (Min. and Eng. Wld., July 13, 1911; ⅔ p., illus.) 20c.

16,501—MINE SAMPLING—The Office Records of Mine Sampling. A. Livingstone Oke. (Mex. Min. Journ., June, 1911; 1¾ pp., illus.) 20c.

16,502—RARE EARTHS—The Stearate Separation of the Rare Earths. C. W. Stoddart and C. W. Hill. (Journ. Am. Chem. Soc., July, 1911; 14 pp.) 60c.

16,503—SILVER—The Estimation of Silver by Deposition from an Ammoniacal Solution of the Oxalate. F. A. Gooch and J. P. Feiser. (Am. Journ. of Sci., Feb., 1911; 3 pp.) 40c.

16,504—SILVER AND CADMIUM — The Rapid Determination of Silver and Cadmium by Means of the Gauze Cathode and Stationary Anode. Raymond C. Benner and William H. Ross. (Journ. Am. Chem. Soc., July, 1911; 6 pp., illus.) 60c.

16,505—TITANIFEROUS SUBSTANCES—Ueber die Analyse Titanhaltiger Körper. K. Bornemann. (Stahl u. Eisen, May 4, 1911; 2¾ pp.) On the analysis of titaniferous substances. 40c.

16,506 — VANADIUM — A Colorimetric Method for Vanadium in Iron and Steel. C. R. M'Cabe. (Chem. Engr., June, 1911; 4½ pp.) 40c.

INDUSTRIAL CHEMISTRY

16,507—AMMONIA—The Manufacture of Ammonia in By-Product Coke Ovens. Louis Cleveland Jones. (Journ. Ind. and Eng. Chem., Aug., 1911; 4¾ pp., illus.) 60c.

16,508—LITHOPONE—Lithopone and Its Manufacture. S. Bose. (Sci. American, July 1, 1911; ½ p.) 20c.

16,509—SULPHURIC ACID—Die Prüfung der Füllkörper für Säuretürme. Petersen. (Zeit. f. angew. Chem., May 26, 1911; 2¾ pp.) The testing of filling material for acid towers. 40c.

MATERIALS OF CONSTRUCTION

16,510—CEMENT MILLS—Power and Heat Distribution in Cement Mills. L. L. Griffiths. (Journ., A. S. M. E., June, 1911; 9 pp.)

16,511—CONCRETE in Mining. Jerome B. Landfield. (Min. and Sci. Press, July 8, 1911; 1 p.) 20c.

16,512—CONCRETE—Mixing and Conveying Concrete by Compressed Air. (Eng. News, Aug. 10, 1911; 1 p., illus.) 20c.

16,513—CONCRETE—Practical Tests of Sand and Gravel Proposed for Use in Concrete. R. S. Greenman. (Eng. Rec., July 15, 1911; 1¼ pp.) 20c.

16,514—CONCRETE—The Expansion and Contraction of Concrete While Hardening. A. T. Goldbeck. (Eng. Rec., July 15, 1911; 1 p., illus.) 20c.

16,515—PORTLAND CEMENT—German Methods of Portland Cement Manufacture—Dry and Wet Processes. (Cement Age, July, 1911; 12 pp., illus.) 20c.

16,517—TIMBER PRESERVATION—Ueber den Wert von Laboratoriumsversuchen für die Holz Imprägnierung. Nowotny. Zeit. f. angew. Chem., May 19, 1911; 5 pp.) On the value of laboratory tests for the impregnation of timber. 40c.

Mining and Metallurgical Patents

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

A Classified List of New Inventions

COAL AND COKE

COAL CUTTING—Improvements in or Relating to Machines for Cutting Coal and Other Minerals. Ignaz Beissel, Aix-la-Chapelle, Germany. (Brit. No. 18,541 of 1910.)

COKE OVEN. Gustavus E. Behr, Jr., Brooklyn, N. Y. (U. S. No. 996,829; July 4, 1911.)

COKE OVENS—Improvements in Apparatus for Leveling the Charge in Horizontal Retort Ovens. Firm Bochumer Eisenhütte Heintzmann & Dreyer, Bochum, Germany. (Brit. No. 2633 of 1911.)

COKE OVENS—Improvements in or Relating to the Doors of Coke Ovens. Stettiner Chamotte-Fabrik Akt. Gesellschaft, Stetten, Germany. (Brit. No. 8105 of 1911.)

COKE OVENS—Improvements in the Construction of Coke Ovens to Make them Proof against the Action of Alkalies. William Greaves, N. Alferton, Eng. (Brit. No. 12,210 of 1910.)

COKE-QUENCHING MACHINE. John W. Seaver, Cleveland Heights, and James E. A. Moore, East Cleveland, Ohio. (U. S. No. 998,556; July 18, 1911.)

COKING FURNACE. Leland L. Summers, Chicago, Ill., assignor to Continuous Process Coke Company, Chicago, Ill. (U. S. No. 13,274; July 18, 1911.)

DRILLING—Improvements in and Relating to Manual Coal- and Rock-Drilling Machines. T. Lippcett, Tredegar, Eng. (Brit. No. 25,518 of 1910.)

EXPLOSIONS—Improvements in the Prevention of Explosions in Coal Mines. Charles S. Bailey, Lancaster, Eng. (Brit. No. 15,925 of 1910.)

SAFETY LAMP—Electric Safety Lamp. Bruno Christiansen, Cologne-Sülz, Germany. (U. S. No. 999,298; Aug. 1, 1911.)

WASHING—Apparatus for Washing Coal. Joseph Dodds, Rutherglen, Scotland. (U. S. No. 998,163; July 18, 1911.)

WASHING—Coal-Washing Apparatus. Jas. A. Montgomery, Birmingham, Ala., assignor to Montgomery Coal Washing and Manufacturing Company. (U. S. No. 998,373; July 18, 1911.)

WASHING—Improvements Relating to the Separation of Water from Washed Coal, Coke and Other Materials. Hardy Patent Pick Co., Ltd., and George Smith, Sheffield, Eng. (Brit. No. 14,160 of 1910.)

WEIGHING PAN for Coal Tipples. Harry E. Miller, Ford City, Penn. (U. S. No. 998,918; July 25, 1911.)

GOLD AND SILVER

CONCENTRATING AMALGAMATOR. Royer Luckenbach, Colwyn, Penn. (U. S. No. 999,814; Aug. 8, 1911.)

CYANIDE—Composition of Matter to be Used in Extracting Precious Metals from Their Ores. Hans Foersterling, Perth Amboy, N. J., assignor to Roessler & Hasslacher Chemical Company, New York, N. Y. (U. S. No. 999,215; Aug. 1, 1911.)

CYANIDING—Treatment of Precious Metalliferous Ores. John Collins Clancy, New York, N. Y., assignor to Clancy Metals Process Company. (U. S. No. 998,749; July 25, 1911.)

DREDGING—Hydraulic Dredging Apparatus. Fred H. Gridley, Longbeach, Cal., assignor of forty-five one-hundredths to North American Dredging Company of Nevada, Los Angeles, Cal. (U. S. No. 996,237; June 27, 1911.)

TUBE MILL—Vertical Tubular Mill for Fine Grinding. Charles Morel, Domene, France. (Brit. No. 21,744 of 1910.)

IRON AND STEEL

BLAST FURNACES—Improvements Relating to the Supply of Superoxygenated Air to Blast or Other Furnaces. Société Anonyme d'Ougrée-Marchaye and Société pour l'Utilisation de l'Air et des Derives, Ougrée, Belgium. (Brit. No. 26,954 of 1910.)

MANUFACTURE OF STEEL. William R. Walker and James H. Gray, New York, N. Y. (U. S. No. 1,000,217; Aug. 8, 1911.)

LEAD, ZINC AND OTHER METALS

ALUMINUM ALLOY, Consisting of Aluminum, Magnesium and Copper. Conrad Hubert Heinrich Claessen, Berlin, Germany. (U. S. No. 995,113; June 13, 1911.)

ZINC—Process of Electrolytic Refining of Zinc. Kunigoro Namekawa and Jishichiro Miyazawa, Shitaya, Tokyo, Kumazo Miyabara, Hongo, Tokyo, and Shotaro Emura, Shitaya, Tokyo, Japan. (U. S. No. 998,379; July 18, 1911.)

ZINC—Process of Separating Zinc or Zinc Oxide. Georg Wannschaff and Josef Savelsberg, Papenburg, Germany. (U. S. No. 999,420; Aug. 1, 1911.)

NONMETALLIC MINERALS

SALT—Melting and Purifying of Salt and Other Substances. Ernest R. Royston, Liverpool, England, assignor to International Salt Company, Limited, London, Eng. (U. S. No. 997,857; July 11, 1911.)

SALT—Process of Refining Salt and Recovering Its Impurities as By-Products. Charles Glaser and George J. Muller, Baltimore, Md. (U. S. No. 13,268, reissue; July 11, 1911.)

MINING—GENERAL

DRILL—Rock Drill. Warren Wood, Paterson, N. J. (U. S. No. 997,591; July 11, 1911.)

DRILL SUPPORT. Judge R. Wilson, Pineville, Ky., assignor of one-half to Finley F. Wilson, Pineville, Ky. (U. S. No. 999,137; July 25, 1911.)

DRILLING—Improvements in and Relating to Grappling Tools for Extracting Broken Rock Drills and the Like from Holes. Edgar Weekes, Armsted, Mont. (Brit. No. 16,852 of 1910.)

DRILLS—Improvements in or Connected with Cradles for Rock Drills. William C. Stephens, Carn Brae, Cornwall, Eng. (Brit. No. 14,110 of 1910.)

DRILLS—Improvements in or Relating to Rock Drills. Daniel Shaw Waugh, Denver, Colo. (Brit. No. 25,940 of 1910.)

DRILLS—Valve Mechanism for Rock Drills. Fordyce C. Loomis, New Philadelphia, Ohio. (U. S. No. 995,614; June 20, 1911.)

FIRES—Means for Quenching and Arresting Fires in Mines. Ralph Dixon Cochrane, Hetton-le-Hole, England. (U. S. No. 1,000,236; Aug. 8, 1911.

HOIST—Mine Hoist. Sven T. Nelson, Chicago, Ill., assignor to Sullivan Machinery Company, Chicago, Ill. (U. S. No. 999,841; Aug. 8, 1911.)

HOISTING—Safety Device for Reversible Winding or Hauling Plants. William Philip, Germiston, Transvaal. (U. S. No. 999,520; Aug. 1, 1911.)

MINER'S CANDLESTICK. Henry D. Buys, Emmett, Ida. (U. S. No. 996,308; June 27, 1911.)

MINER'S LAMP. Grant I. Rawson and Llewellyn B. Shultz, St. Louis, Mo., assignors to Pilley Packing and Flue Brush Manufacturing Company, St. Louis, Mo. (U. S. No. 996,675; July 4, 1911.)

MUCKER for Removing Ore, Rock, Dirt and Other Material from Tunnels. John Geo. Leyner, Denver, and Silas A. Knowles, Golden, Colo., assignors of three-fourths to the J. George Leyner Engineering Works Company, Denver, Colo. (U. S. No. 1,000,336; Aug. 8, 1911.)

SHAFT LINING. Henry J. Wessinger, Duluth, Minn. (U. S. No. 996,178; June 27, 1911.)

SHAFT SINKING—Safety Device for Shaft Sinking. Thomas Bryant, Butte, Mont., assignor of one-half to Arthur H. Wethey, Butte, Mont. (U. S. No. 998,599; July 25, 1911.)

TUNNELING MACHINE. William R. Collins, Georgetown, Colo. (U. S. No. 1,000,075; Aug. 8, 1911.)

WALLING OF MINES. Friedrich Nellen, Essen-on-the-Ruhr, Germany. (U. S. No. 999,582; Aug. 1, 1911.)

WIRE-ROPE TRAMWAYS—Tightening and Supporting Means for Wire-Rope Tramways. Henry A. Welcher, Denver, Colo., assignor of one-half to John C. Reagan, Whitepine, Colo. (U. S. No. 997,322; July 11, 1911.)

ORE DRESSING—GENERAL

CLASSIFYING—Improvements in Apparatus for Classifying or Grading Crushed Ore and Like Pulverulent Material. George H. Stanley, Johannesburg, South Africa. (Brit. No. 25,746 of 1910.)

CONCENTRATOR — Ore Concentrator. Frank Franz, Burke, Idaho, assignor of one-half to Eugene R. Day, Wallace, Ida. (U. S. No. 995,449; June 20, 1911.)

CRUSHER—Stone Crusher. Edgar B. Symons, Milwaukee, Wis., assignor to Smith & Post Company, Milwaukee, Wis. (U. S. No. 1,000,049; Aug. 8, 1911.)

CRUSHING—Head-Adjusting Device for Gyratory Stone Crushers. Edgar B. Symons, Milwaukee, Wis., assignor to Smith & Post Co., Milwaukee, Wis. (U. S. No. 995,044; June 13, 1911.)

CRUSHING—Machines for Pulverizing or Crushing Ore and the Like, Applicable also as a Concentrator or as a Mixer. Mitis Quenner, Nogales, Ariz. (Brit. No. 25,346 of 1910.)

DRY-ORE SEPARATION, Process for. William W. Bonson, Dubuque, Iowa. (Brit. No. 29,971 of 1910.)

JIG. Charles A. Duncan, Mullan, Ida. (U. S. No. 995,848; June 20, 1911.)

MAGNETIC SEPARATOR. Erastus S. Bennett, New York, N. Y. (U. S. No. 999,736; Aug. 8, 1911.)

ORE WASHER. Alexander M. Gow, Duluth, Minn. (U. S. No. 998,573; July 18, 1911.)

SEPARATING AND WASHING APPARATUS. Charles E. Christ, Tamaqua, Penn. (U. S. No. 999,545; Aug. 1, 1911.)

SEPARATION—Improved Process of Separating the Constituents of Rocks or the Like. Gunnar Sigge Andreas Appelgvist and Einar Olof Eugen Tyden, Stockholm, Sweden. (Brit. No. 1211 of 1911.)

SEPARATOR — Electrostatic Separator. Clarence Q. Payne, New York, N. Y. (U. S. 997,322; July 11, 1911.)

METALLURGY—GENERAL

ELECTRIC FURNACES—Improvements in Revolving Electrical Furnaces. Attokar Serpek, Paris, France. (Brit. No. 29,299 of 1910.)

ELECTRIC-FURNACE ELECTRODE. Carl Hering, Philadelphia, Penn. (U. S. No. 999,719; Aug. 1, 1911.)

FOREHEARTH — Tilting Forehearth for Furnaces. Theodor Löhe, Hennef, Germany. (U. S. No. 998,787; July 25, 1911.)

LEACHING PROCESS — Apparatus for Bringing a Gas Into Contact with a Liquid. H. T. Durant, London, England, assignor to the Metals Extraction Corporation, Limited, London, England. (U. S. No. 999,213; Aug. 1, 1911.)

REDUCTION—Improved Method of Reducing Metals from their Ores. Sven Emil Sieurin, Höganäs, Sweden. (Brit. No. 11,807 of 1910.)

ROASTING—Improvements in or Relating to Mechanical Ore-Roasting Furnaces. John Harris, Sheffield, Eng. (Brit. No. 23,331 of 1910.)

SMELTING AND CONVERTING FURNACE—Apparatus for the Treatment of Ores. George Mitchell, Los Angeles, Cal. (U. S. No. 997,405; July 11, 1911.)

SMELTING FURNACE — Apparatus for Smelting Ores. John W. Nesmith, deceased, Denver, Colo., by Harper M. Orahood, executor, Denver, Colo., assignor to Colorado Iron Works Company, Denver, Colo. (U. S. No. 995,365; June 13, 1911.)

SMELTING GASES—Apparatus for Treating Acidulous Gases Produced in the Smelting or Treatment of Ores. Clarence B. Sprague, Salt Lake City, Utah, assignor to United States Smelting, Refining and Mining Company, Portland, Me. (U. S. No. 992,391; May 16, 1911.)

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

The Hill Publishing Company has purchased the *Engineering News*.

F. Augustus Heinze is at Butte, Mont., for an extended stay.

B. B. Thayer is expected home from Europe early in September.

R. P. Wheelock, of Battle Creek, Mich., is in Los Angeles, Cal., on a business trip.

W. E. Defty is at present engaged making an examination of the North Star mine, in Arizona.

R. D. George, professor of geology at the University of Colorado, was in Vancouver, B. C., recently.

D. Lorne McGibbon, of Montreal, has resigned from the directorate of the Nipissing Mining Company.

W. J. Dick, of Ottawa, Ont., mining engineer to the Canadian Conservation Commission, has been in British Columbia lately.

Robert E. Cranston, of Sacramento, is on a professional trip to Plumas county, Cal., where he will remain until early in September.

Robert H. Richards is spending a month in Denver on professional business. He expects to return to Boston about Sept. 17.

Felipe Gomez del Campo has established an office as consulting mining engineer at No. 5 Calle de la Reforma, San Luis Potosi, Mexico.

J. B. Tyrrell, of Toronto, Ont., who recently returned from London, has gone to Swastika to make an examination of the Lucky Cross property.

Dr. R. W. Brock, director of the Geological Survey of Canada, was in British Columbia late in August, visiting Skeena and Portland Canal districts.

Alexander Grant, who has been in charge of the Marble Bay copper mine on Texada island, B. C., has retired from active management of the property.

Dr. W. H. Weed, of the firm of Weed & Probert, has just returned from an examination of the Interstate Mining Company's property in the Cœur d'Alene district.

James A. Macdonald, of New York, has been on a trip through the Rocky mountains by the Canadian Pacific. He went thence via Vancouver, B. C., to San Francisco.

John C. Searight, superintendent of blast furnaces for the Republic Iron and Steel Company in the Northern district, with headquarters at Youngstown, Ohio, has resigned.

Byron N. White, of Spokane, Wash., has returned home after having spent several weeks at Whitehorse, southern Yukon, in which locality are copper mines owned by him.

Anthony J. McMillan, liquidator of the Le Roi Mining Company, was in Chicago lately, on his way back to Rossland, British Columbia, after having spent three months in Great Britain.

Dr. Heinrich Ries is in British Columbia, obtaining information regarding the clay deposits of that part of Canada for use in a report he is to prepare for the Canadian Department of Mines.

W. F. Sloan and W. J. Huddle have organized to carry on their advisory and consulting practice under the firm name of Sloan, Huddle & Co., with offices in Carroll block, Madison, Wisconsin.

Jay P. Graves, general manager of the Granby Consolidated Mining, Smelting and Power Company, Ltd., left Vancouver, B. C., Aug. 14, on a visit to the company's Hidden Creek mine, at Goose bay, Observatory inlet.

James Humes, formerly superintendent for the Austin-Manhattan Consolidated Mining Company, Austin, Nev., is reopening the King Solomon, a partly developed copper property situated about 30 miles from Victoria, Vancouver island.

Charles J. Sturtevant has resigned his position as resident manager for the Galanista Gold Mining Company, San Manuel de la Cumbre, Sinaloa, Mexico, in order to take the same position with the Parcionera Lease, Cusihuiriachic, Chihuahua.

Harrison Stuart Matthews, of Birmingham, Ala., vice-president and general manager of the Alabama Consolidated Coal and Iron Company, who is to be president of the merged company of the Alabama Consolidated and the Southern Iron and Steel Company, is in New York.

Sidney S. Schmidt, a graduate of the Missouri School of Mines, and at present a chemist for the Washoe smeltery at Anaconda, Mont., has been appointed assistant in mineralogy at Northwestern University. He will take the place of A. J. Ellis, who resigned to accept an appointment on the U. S. Geological Survey.

T. J. Drummond, of Montreal, president of the Lake Superior Iron Corporation, recently returned from the congress of steel manufacturers in Brussels. While abroad he completed financial arrangements for the extension of the Algoma Central and the Algoma Eastern lines, controlled by the Lake Superior Corporation.

C. H. Elliott, formerly superintendent of the Atlanta Steel Company, Atlanta, Ga., has been appointed superintendent of the new open-hearth steel plant to be built by the Youngstown Sheet and Tube Company, Youngstown, O. He will supervise the erection of the six new furnaces to be built after plans now being prepared in the company's engineering department under the supervision of Julian Kennedy, consulting engineer.

OBITUARY

O. M. Steele, manager of the Cleveland yards of the American Ship Building Company, died Aug. 17, aged 68. He was an engineer on the Great Lakes for 20 years and brought out the first iron steamship used on the lakes. About 27 years ago he became associated with Robert Wallace, of the Cleveland Ship Building Company, now part of the American company, and became manager of the local yards.

Charles E. Starr, treasurer of the Boston-Washington Mining and Milling Company, died suddenly, Aug. 15, at the head of Teanaway creek, Washington. A letter just received says: "Charlie fell from his horse, struck on his head and never spoke again. The body has been sent east for burial at Wolfville, N. S." Mr. Starr had been much interested in mining for some years past, first at the copper mine at Le Tete, Nova Scotia, and for the past two years at Liberty, Wash., where the company of which he was treasurer has just built a mill for working the quartz deposits in Cougar gulch, Kittitas county.

SOCIETIES and TECHNICAL SCHOOLS

American Mining Congress—The fourteenth annual meeting will be held at Chicago, Sept. 26 to 29. President Taft, John Hays Hammond, J. J. Hill and Secretary of the Interior Fisher will be principal speakers. President Taft will be in Chicago to attend the opening of the United States naval training station, North Chicago, and will devote one day to the convention.

American Peat Society—The fifth annual meeting will be held at Kalamazoo, Mich., Sept. 21 to 23. The papers and discussion will cover a wide range of topics connected with the utilization of peat as fuel and for other purposes. Inspection will be made of the peat-fuel plant in operation near Kalamazoo. The manufacture of gas from peat will also be discussed. Julius Bordollo, Kingsbridge, New York City, is secretary of the society.

Mining Men's Club of Spokane—The Mining Men's Club at Spokane, Wash., has formulated plans for a convention of mining men of the Northwest, to be held during the Interstate Fair week about the beginning of October. It is planned to hold several meetings on the fair grounds, and conclude with a banquet in the city of Spokane on Oct. 5. The executive committee in charge of arrangements includes J. T. Omo, L. K. Armstrong, J. W. Turner, J. W. McBride and J. Cleveland Haas.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

Aug. 23—The complaint filed with the Interstate Commerce Commission by the Associated Oil Company, alleging aggregate overcharges of $13,468 for hauling crude oil from McKittrick and Olig through Bakersfield to Seligman, Ariz., is an interesting chapter in the history of oil-freight rates from California fields. It recalls the strenuous fight made by the independent producers five years ago, when the U. S. Bureau of Corporations stepped in and proved through insistent investigation that while the rates were excessive and prohibitive of profitable operation of independent wells, the Associated, the Standard, and some others were receiving rebates from the Southern Pacific and the Santa Fé. The Associated vehemently denied receiving rebates, and the Santa Fé was loud in its declaration that no rebates had been given by that road. The Southern Pacific and the Standard sawed metaphorical wood, apparently admitting that to dispute the published report of the commissioner of corporations would not disprove the truth of it. The independents were benefited by the disclosures of the investigation in an increased price for their product, whether or not there was a cessation of the rebates. The present complaint of the Associated that it has been charged excessive rates by the Southern Pacific may be taken as circumstantial, if not positive evidence that the giving and receiving of rebates has ceased so far as its relations with the Southern Pacific are concerned. The interesting feature of the situation is that during the period when the Associated complains it was being so grossly overcharged, the Southern Pacific owned 51 per cent. of its stock, and the railroad company was making a neat margin in freight rates, even if it were losing something in the operation of the wells and the buying and selling of oil. To be made the "fall guy" by a corporation which the Associated once looked upon as being its savior must be embarrassing, to say the least.

Denver

Aug. 28—The Portland company, of Cripple Creek, is contemplating the immediate erection of an addition to its local mill to increase the capacity from 300 to 500 tons. The process used in the recently completed mill has proved to be successful. The quantity of ore treated during August will be about the same as that for July and may run close to 10,000 tons. The grade of the ore will be about the same as milled last month.

Negotiations for a settlement of the strike of miners in the northern coalfields is ended. President John P. White, of the United Mine Workers of America, left for Pittsburg, Kan. He stated that under no conditions could the men accept the offer of the operators; the only concession they would offer Mr. White was that the 14 men in the county jail would be released if the strike was called off. Last week, Attorney O. N. Hilton arranged terms of settlement with James H. Blood, attorney for the Northern Coal and Coke Company. They were agreed to, and President White was telegraphed for. They called for the release of the men from jail at once, all to be taken back as soon as practicable without restriction, the company to pay fines, costs assessed against the imprisoned men to be remitted, and the men to go back to work at the old scale of wages. After an interview between C. B. Kountze and F. F. Struby, president of the Northern Coal and Coke Company, President Struby announced that he would not consent to the terms arranged for by Attorney Blood and authorized Attorney Siekman, of Lafayette, to state that the union would not be recognized. On Aug. 23, Judge Musser, of the Court of Appeals, granted liberty to 12 of the 14 miners in the county jail held in contempt of court, and sentenced by Judge Whitford in June of this year.

Butte

Aug. 21—Affidavits in the Anaconda-Butte & Ballaklava suit have been filed in the district court, stating that certain conditions exist making a fair trial impossible in this city and county. A change of venue to another county is asked for. It is claimed that three daily papers are controlled by the Amalgamated as well as the Credit Men's Association which is able to put any merchant in a serious predicament by refusing him credit. These conditions are likewise claimed to be present in Deer Lodge as well as in Silver Bow county.

There is no question now but that the Ophir mine of the Butte Central Copper Company will become an important producer. High-grade silver ore has been shipped and 50 tons of ore per week is being sent to the Washoe smeltery. An electrically driven compressor is being installed. Following the recent visit of the president of the company, comes the report that the mine is to be equipped with electric power throughout and that the machinery has been ordered for the new concentrator, work on which will commence at once.

Salt Lake City

Aug. 24—A dinner was given by the Tintic Mine Operators' Association, in honor of George Otis Smith, director of the U. S. Geological Survey, July 17, at the Hotel Utah. At the request of C. E. Allen, president of the association, Mr. Smith expressed his views on the apex law, advocating its abolition and the substitution, in its place, of a vertical side-plane law. He also expressed himself in favor of a general revision of mineral-land legislation, rather than the patching up of existing statutes, and asked for a broad general consideration of the whole question. Mr. Smith urged the men of the West to add their knowledge of actual conditions to the disinterested enthusiasm which some of the Eastern men are contributing. He said: "Your feet are on the ground, and their heads are in the clouds, so that to get the best results you must work with them." To have any value conservation must be practical, and the greater part of the really productive work in conservation must be contributed by the engineer acting for capital, and the farmer working for himself. If conservation is defined as utilization with maximum efficiency and minimum waste, it is something more than theory. It is the kind of engineering practice which shows results on cost sheets, and makes dividends. Real development is wanted on mineral claims, and not technical compliance with out-of-date laws. Equal opportunity for work is urged, but if the land is to be kept idle its title should remain in the people. The condition for occupancy should be that expressed by "Dig or get off the claim." If practical legislation is to be secured along these lines for the benefit of all classes, the practical men of the West must put their shoulders to the task. Mr. Smith urges a coöperation between the East and the West in securing the best results.

A special meeting of the stockholders of the Southern Utah Railway, the Consolidated Fuel Company and the Castle Valley Coal Company has been called for the purpose of ratifying a bond issue, which will cover all the outstanding indebtedness of the coal-mining and railroad companies. The coal bonds amount

to $300,000, and the railway bonds to $75,000, on properties worth $600,000, according to Government estimate, exclusive of $800,000 spent in improvements.

In the final action in the case of the State of Utah *versus* the Montello Salt Company, the United States Supreme Court decided in favor of the defendant, thus reversing the decisions of the district court and State supreme court. The State supreme court has met and received the order of the United States Supreme Court, and ordered the remitment issued to the lower court. The case involved title to 40,000 acres of salt land taken up by the Montello Salt Company, and claimed by the State for the University of Utah. The point in dispute was the meaning of the language of the enabling act of Congress, which gave to the university 110,000 acres of saline land "and including all the saline lands in said State." The supreme court holds the latter phrase to be restrictive, limiting the saline lands owned by the University of Utah to 110,000 acres.

Birmingham, Ala.

Aug. 26—James G. Oakley, president of the State convict board, while in Birmingham last week, announced that efforts would be made to get contracts with coal companies who work convicts similar to the one drawn up with the Pratt Consolidated Coal Company; that is, the men to mine the coal for the company owning the mines at a stipulated price, the State to be in direct charge of the convicts. The contract with the Pratt Consolidated Coal Company goes into effect Nov. 15 and 400 convicts are to be worked. The State will not be in the coal business but will control the men. It is expected, however, that the State will realize more from the convicts in the new way of handling them.

Deadwood

Aug. 25—Suit to adjudicate water rights along the Spearfish, Redwater, Crow and Whitewood creeks has been instituted by J. B. Case, of Belle Fourche. It is understood that action is being taken for Government and State authorities, and that an effort will be made to cut down the amount of water being used by certain mining companies. One hundred and seventy-six defendants are named in the suit, among them being the Homestake company, which is a large user of water from the head of Spearfish creek. This water is pumped across the divide to Whitewood gulch, and flows by gravity to Lead.

Work of construction has been started on a substation of reinforced concrete, at Lead, where the power from the Spearfish hydroelectric plant will be received and distributed to the surrounding mills. The stamp mills, crushers, machine shop, foundry and cyanide plants will be electrically driven. The air compressors and hoists will not be changed now.

Globe

Aug. 23—It is understood that a meeting of representative Arizona Commercial bond and stockholders will be called within a few days at which a committee will be appointed to make plans for a reorganization. There is a bond issue of $1,000,000 outstanding. An assessment of $5 per share may be levied which will provide the company with $600,000. The plan of disposing of a half interest in the smeltery to the Superior & Boston has not been carried through, so no funds were received from that source. The company owns two properties, although in recent years work has been done only at the Black Hawk. The expenditures during the last five years have reached $2,000,000, but to date no quantity of ore sufficient to supply the smeltery has been developed. A drift on the 10th level shows good ore for 100 ft., while on the 12th level crosscutting is being done that will probably be continued to the Old Dominion fault, which was found in the Superior & Boston adjoining the Arizona Commercial. The Copper Hill mine of the company is considered by some engineers as more promising than the Black Hawk. It adjoins the United Globe property of the Old Dominion company and developments in the United Globe indicate the presence of good ore in its neighbor. It is reported that a corps of geologists is formulating a plan of development.

Cobalt

Aug. 25—During the month of July, 17 Cobalt mines shipped a total of 1850 tons of ore. This tonnage is a decrease over the corresponding period for the preceding year, but on account of the greater amounts of concentrates shipped the values are higher.

A new gold district near Shining Tree, 40 miles north of Gowganda Junction, is attracting many prospectors, and a large number of claims have been staked. Free gold is in evidence on many of these. On a location staked by Alfred Gosselin, the pioneer discoverer, a 10-ft. vein of quartz stated to contain free gold has been uncovered. A rush to the district has set in. It is about two days' journey by canoe from the railway at Gowganda Junction.

Porcupine

Aug. 25—The West Dome company has purchased the outstanding interest in the two Kertz claims, of which there has been so much discussion and talk of threatened litigation. When F. Augustus Heinze and his associates purchased the Foster properties, the contract did not include a half interest in the two Kertz claims, on which was found the principal showing. It was believed at first that a partition sale would be necessary before matters could be adjusted, as there was some friction between the owners, but the matter was settled as stated.

The plans of the Temiskaming & Northern Ontario Railway for the extension of the Porcupine branch provide for its crossing the Pearl lake district through the Hollinger property to the Campbell veteran claim, where a new town will be built up, to be known as "Timmins." The road will follow the contour of Pearl lake. Arrangements have been made by many of the large mining companies to make the new town their headquarters and many of their employees will find homes there. The townsite is close to the Mattagami river.

Victoria, B. C.

Aug. 21—A fund of $25,000 has been subscribed by the United Mine Workers, lately in the State convention at Seattle, to assist the miners and other coal-mine employees who have been on strike five months in southeastern British Columbia and Alberta.

The vote of the members of locals in District No. 18, U. M. W. of A., relative to acceptance of the recommendations of the chairman of the board of conciliation as to the scale of wages to be paid to miners and other employees of the Western Coal Operators Association, Canada, resulted in a majority of about five to one against acceptance. The Operators Association afterward decided to reopen the various mines and endeavor to secure sufficient men to work them independently of the local unions.

George Temperley, of Roslyn; Peter Henretty, of Jonesville; F. A. Hill, of Wilkeson; and J. B. Warriner, of Tacoma, were recently appointed to serve with the State inspector of mines, D. C. Botting, on a commission authorized by the last legislature to examine the coal mines of the State of Washington and to recommend to the next legislature needed changes in the laws of the State affecting the mines. Later, H. P. McLean, of Wilkeson, was appointed to take the place of Mr. Henretty, who had resigned.

San Luis Potosi

Aug. 18—The labor situation in this district has been much as in other parts of the republic, but thus far sober counsel has prevailed so that few shutdowns and little violence have resulted. A strike seemed imminent at the smeltery for a few days, but the men were appealed to by the Maderist leaders. Such a strike would have caused a cessation of work at many of the mines. About 1200 men are employed at the smeltery, but a strike would have affected 4000 men. The strike of the miners at Los Charcos threatened the closing of the Tiro General mine. Negotiations were underway for the sale of the mine to the American Smelting and Refining Company and the strikers evidently thought that a settlement would be made at all costs rather than close the mine at such a time. Their attitude had no significance with purchaser or vendor, and the sale was made.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

Alaska United—For the month ended July 15, the Ready Bullion and 700-ft. Claim mills crushed 34,015 tons, yielding $72,851 gross and net $24,148. Total operating expenses were $48,703; construction, $24,036. The ore at the Ready Bullion mill averaged $2.36 per ton and $1.97 at the 700-ft. Claim mill.

Arizona

Graham County

Lone Star—Sulphide ore has been cut in a tunnel in the Clara mine in the Clifton district.

Detroit Copper—The plans for the new smeltery to be built at Morenci have been approved.

Gila County

Iron Mountain—This group of 10 claims, five miles south of the Live Oak property, is to be developed. A pump and other machinery are to be installed. There is a good wagon road to the mines. Frank Thompson is owner.

Sleeping Beauty—At this mine, nine miles northwest of Globe, drifting is to be started from the bottom of the recently finished 100-ft. shaft. Robert Farmer, the lessee, is about ready to ship a carload of ore to El Paso.

Globe Western—Ore has been shipped to the Old Dominion smeltery.

Mineocal Farms Development Company—This company has a lease on the property of the Globe Mining Company, three miles east of Globe. Development work is to be commenced at once. Chicago men are financing the enterprise.

Maricopa County

A gypsum deposit has been discovered near Phœnix. A 40-ton plant is now under construction; the products will be gypsum building blocks, land plaster and plaster of paris.

Pinal County

Ray—A concrete conduit is being built to carry the mill tailings to the valley, so that they will not mingle with the water of the Gila river.

Yavapai County

Copper Queen Gold Mining Company—A strike of rich chalcopyrite ore was recently made at this mine, near Stoddard. Louis Goldman is manager.

United Verde—General Manager Charles W. Clark states that development of the North and South Venture claims will be started within two months. These claims are near Jerome; they have been developed to some extent by a vertical shaft.

Yuma County

Clara Consolidated—A contract has been made with the Consolidated Arizona Smelting Company to exchange 100 tons of ore per day of a nature needed in fluxing the charges of the respective smelteries of the companies at Swansea and Humboldt.

Billy Parker—This mine, six miles northeast of Parker, is equipped with hoist and mining machinery. About 18 months ago ore was shipped to El Paso, but work ceased upon the death of a man who had an option on the property. A syndicate is now negotiating the purchase of the mine.

California

Amador County

Hardenberg—The three-compartment shaft has been sunk to 400 ft. and will be deepened to 1000 ft., which depth may be reached before actual development of the levels will be undertaken.

Butte County

Skipper—The indications from the ore already mined, and the extent of the vein shown by prospecting, are sufficient to warrant the erection of a stamp mill. The property is near Magalia. William Kempf, of Chico, is president.

Magalia Consolidated—Suit to foreclose on the mortgage of $20,000 has been filed against this company by D. J. Coyne, who asks decree to sell to highest bidder.

Eldorado County

Woodside Eureka Mining Company—J. U. Secrest, a stockholder, has petitioned for a receiver to be appointed by the superior court of Alameda county. The company was organized at Oakland with an authorized capital of $500,000, and has $10,000 worth of machinery at the mine near Georgetown, which remains undeveloped.

Kanaka—A big flow of water coming from the adjoining Harris shaft into the Kanaka new shaft will necessitate the installation of a new and larger pump. L. E. Parr, Groveland, manager.

Kings County

King—G. W. Warner, manager, Coalinga, has interested Canadian capital in the proposed reopening of this old quicksilver mine. A 10-ton furnace will be built.

Mariposa County

Mountain View—Daniels & Condray, lessees of this mine, owned by the Mariposa Commercial and Mining Company, report the extraction and milling of high-grade ore.

Mariposa Commercial and Mining Company—Improvements on the properties of the Mariposa grant will be started by repairing the dam and flume of the electric power system at Bagby. F. T. Maguire, manager.

Plumas County

Salmon Falls—Eight hundred feet of 4-in. pipe to be used as a siphon has been laid at this gravel mine on the north fork of the Feather river. The pipe was hauled by wagon from the railway a distance of two miles, then dragged over bad trails. The property is developed by an 800-ft. tunnel, which was driven too high, necessitating sinking a winze 10 ft. to bottom the gravel, which made water rapidly. The siphon will be an economical method of drainage.

Shasta County

Delta Consolidated—The new railroad built by this company for the transportation of fluxing ores to the Mammoth smeltery at Kennett made its initial trip, Aug. 14, carrying a carload of ore from the Preacher mine, which has 80 tons more on the dump ready for shipment. The Delta will also ship to Kennett.

Evening Star—This mine, one of the most important in the Old Diggings district, has been closed down indefinitely on account of the closing of the Balaklala smeltery, upon which it had depended for a market for its ores.

Sierra County

Black Sand Leasing Company—This is a recently organized company with $50,000 capital, that will endeavor to recover gold and platinum from the black-sand concentrate from the undercurrents of six hydraulic giants at the E. L. Goldstein Company's hydraulic mine at Brandy City, commonly known as the Brandy City Mining Company. Gratifying results have attended experiments made with the separator of the Automatic Gold Separator, Ltd., of Los Angeles.

Colorado

Gilpin and Clear Creek Counties

Old Town—This mine in the Russell district is connected with the Newhouse tunnel by a lateral on the vein, which has been driven 5000 ft. The orebodies now being worked are about 2000 ft. on the dip of the vein below the surface. The production for July was $5621; for June, $10,632. George Kimball, of Idaho Springs, is manager.

War Dance—A carload of ore recently shipped to the smeltery at Golden returned $1200. Nearly 1000 tons of dump ore have been shipped from this property and it is estimated that there are another 1000 tons that can be shipped. The ore from this dump will pay for the property, which was bought last April by the smelting company at Golden.

Argo—There is an increasing amount of prospecting going on throughout the Argo tunnel, known for many years as the Newhouse tunnel. At present ore from eight mines is being trammed through the tunnel, these properties being the Consolidated Gem, Sun & Moon, King Bee, Saratoga, Old Town, Dyke, Prize and Gunnell. The output now amounts to over 2000 tons per month.

San Juan Region

Indiana—A rich strike of black copper has been made about 10 ft. above the winze in this mine near Ironton.

Barstow—Development, under the direction of C. R. Wilfley, has opened a shoot of good ore. Other orebodies continue to furnish ample ore for the mill.

La Plata—William M. Grafflin, who has a bond and lease from J. C. Harris on the Big La Plata mine, has struck two veins of ore. The rich streak is sylvanite and shows free gold. About 100 ft. from this new discovery a shaft was sunk 15 ft. in porphyry with no vein visible; the rich ore, just found, is in andesite porphyry.

Treasury Mountain—A long crosscut is being driven underneath Treasury mountain. The Old Belle mill at Titusville has just been purchased and is being repaired for immediate operation. The mill originally cost $20,000 and is a modern plant. S. H. Congdon, is manager.

Brooklyn—Cripple Creek mining men are preparing to operate the Brooklyn mines on Galena mountain. Col. Robert Harper will be in charge of operations. Horace Miller has begun work on the Hard Cash group, where a year ago some fine ore was opened by tunnel. Development work has sufficiently advanced to enable the property to ship ore.

Teller County—Cripple Creek

Hundreds of applications for leases on different properties in the district will be acted upon in the next few days, since the law which made the lessor responsible for debts of the lessee has been vetoed. Mining companies and individuals had been notified by their attorneys to withhold all leases until the terms of this act could be determined, as it was reported that it had been signed. A law making a lien for labor the first lien on a mine was passed and this was confounded with the lessor's liability law.

El Paso Gold King—The output from this mine in Poverty gulch, just east of Cripple Creek, is being maintained by Owen Roberts, lessee. In developing, no attempt was made to open new ground, but some of the known veins were opened at different places and extensions of veins were found. There is much ore in sight, enough to maintain the present output for some time.

Pharmacist—Shipments from this mine on Bull hill have been resumed by lessees and it is expected that the output will run close to 10 cars per month.

Idaho

Humming Bird—No. 5 tunnel has been leased to the Hercules mining company. Drifting was suspended two years ago as a result of failure to disclose orebodies. When completed it will constitute the main working tunnel for the lessees.

Federal—The company is reported to have bonded the Cleveland mine for $400,000. The mine adjoins the Standard-Mammoth group, which was taken over by the Federal company some years ago. This is the first large transaction undertaken by the company since it acquired the Morning mine about seven years ago.

Hypotheek—Ore from the mine, three miles south of Kingston, is being tested in a small mill erected by the company for that purpose, and with suitable provisions for future additions. Electric power has been installed recently.

Massachusetts

Essex Development Company—This company, composed of Lynn men, has inaugurated redevelopment of the old silver-lead mine at Newbury. Two men were killed in the shaft, last week, by drilling into a missed hole.

Michigan

Copper

Calumet & Hecla—James Shields, Louis Saam, M. J. Dillon and J. C. Donahue have filed an intervening petition in the Turner injunction case before Judge Wiest, these steps being taken to insure a continuation of the case in the event of the death of Mr. Turner, or a desire on his part to discontinue it.

Old Colony—The third hole of the present series has been started at a point about 600 ft. east of the second hole, and will be drilled vertically to determine the pitch of the lode in the second hole.

New Baltic—Operations are centered in drifting at the 360-ft. level, only a small force being employed. At this level two parallel lodes were opened by a crosscut, and lying but a short distance apart, each lode showing copper.

Keweenaw—An encouraging looking amygdaloid lode has been uncovered at a point near the Montreal river.

Adventure—The crosscut from the 1028-ft. level of the vertical shaft has cut the second of the copper-bearing lodes, and the latter shows an encouraging amount of copper. Drifting is under way on No. 1 lode.

Iron

The Cleveland-Cliffs Iron company is installing a large power plant on the Carp river. The plans and specifications were prepared by Viele, Blackwell & Buck, consulting engineers, New York. The dam will be four miles from the power house, and a pipe line approximately 22,000 ft. long will conduct the water to the power plant. Part of this line will consist of steel pipe and the balance of Washington fir staves. Two units will be installed at the plant, which is expected to develop about 8000 h.p., and it is planned eventually to operate the machinery at all the mines and shops of the company by electricity.

Missouri

Joplin District

Hackett—The mill is shut down and work abandoned in the "sheet ground." Drifting in the "free ore" area has disclosed a deposit that yields 10 per cent. of blende concentrate, but the "free ore" of this section is pockety and the magnitude of the deposit is very problematical. The Richards classifier is still retained in the mill and is said to be entirely satisfactory. The Richards jig is now said to have been satisfactory insofar as quality of work is concerned.

Katherine—The shaft, at Thoms Station, together with the derrick and hopper, caved in. Another shaft will be sunk.

Katy—It is reported that William West has sold his one-third interest in this mine, at Thoms Station, to his associates for $22,500.

Holdout—The company has completed the sinking of a new shaft and the building of a hopper and tram at its mine, north of Webb City.

American Zinc, Lead and Smelting—The company is planning the erection of a 1000-ton mill at its American Davy mine No. 7, at Prosperity. J. H. Polhemus, Carterville, is manager.

Granby—The 500-ton mill, built by John T. Chapman, of Joplin, has been completed. T. P. Donehoo is manager.

Ramage—S. Y. Ramage is planning to build a 400-ton mill, to take the place of his 100-ton mill, on the Morgan 40 of the Center creek land, at Carterville.

Montana

Butte District

North Butte—It is reported that the vein has been cut on the 2800-ft. level and that the ore is high grade. The shaft station has not yet been cut out on that level, so little work can immediately be done on the vein.

Butte & Ballaklava—Work may soon be resumed on the 1400-ft. level, which, it is claimed, is not in dispute with the Anaconda company's ground. It is said that four known veins south of the shaft are to be developed.

East Butte—It is stated that plans are being made for the extensive use of electricity in the operation of the mines and it is possible that an air-compressor plant will be installed similar to that now in operation at some of the mines of the Anaconda company for hoisting ore. It has been proved beyond a doubt that such an installation can effect a great saving, as the electric power can be obtained on reasonable terms from the Great Falls Power Company.

Broadwater County

Black Friday—W. L. Creden, of Butte, has been making an examination of the property to determine the tonnage of ore to be mined, as a check on former reports.

Hendricks—Enough ore is being mined from these claims to keep the five-stamp mill in operation.

Boyer—A five-stamp mill is being erected and will be in operation soon.

Highland Chief—The group of mines owned by E. M. Smith, of Virginia City, consisting of the Highland Chief, Mountain View and Mountain Flower, are being developed. This property, in the past, has been worked by an inclined shaft on the lode, but as the vein is flat near the surface and abruptly takes a much steeper dip lower down, it has been deemed advisable to sink a vertical shaft, which is now being done on the Highland Chief.

Gallatin County

Western Gallatin Mining and Milling Company—This company, capitalized at $1,000,000, expects to complete the 4½-mile ditch to its property on the west fork of the Gallatin river. Sluicing will then be started immediately.

West Fork Mining Company—The company owns 200 acres of placer ground adjoining the Western Gallatin company's property. Sluicing has been going on all summer in the old river bed. H. J. Miller, of Livingston, is in charge.

Madison County

Winnetka—A main haulage tunnel is being driven through which ore will be delivered to the mill. It is being driven on one of the lower veins and crosscuts will be made from it to the other veins. Work on the mill is to be started Sept. 15. A substation is to be built and power taken from the Economy Power Company's line will be used to drive a compressor and sawmill.

Missoula County

In the Cedar mining district development work is being done on a number of claims upon which there are outcrops of veins carrying gold, silver, copper and lead. Five claims are being developed by the Ridinger & Shattuck Company, in which J. W. Ridinger, of Cœur d'Alene, Ida., is interested.

Sanders County

Montana Gold Mining and Milling Company—This company has started work on four claims, three miles north of Heron. Free-milling gold ore has been found at the surface. Tunnels are now being driven on the quartz veins. H. Feise, of Spokane, Wash., is president.

Nevada

Comstock Lode

Mexican—Cutting out for collar sets and bearers for the new two-compartment winze on the 2500-ft. level was recently completed. The winze will follow the vein down on the incline on the footwall side. The ore extraction for the week ended Aug. 19 was the largest in the history of the mine, consisting of 745 mine cars, of a gross assay value of $34,417, or an average value of $46 per ton. Of this output, 168 cars were of ore, assaying $113 per ton, taken from the 2500-ft. level. On ore shipped to the smeltery in August $23,000 was returned.

Ophir—A stope was started last week on the 2200-ft. level of the mine, making two stopes now producing milling-grade ore. Partial returns from the last milling of ore indicate that the run will show the largest net returns for several years.

Yellow Jacket Mill—The bins have been cleared of Yellow Jacket ore and a run started on ore from the Crown Point mine. For the week ended Aug. 19, 682 tons of ore was treated.

Union Consolidated—The joint three-compartment winze with Sierra Nevada has reached the 2500-ft. level and will be continued 40 or 50 ft. more for sump room. The north drift on the 2400-ft. level continues in low-grade ore.

Ward Shaft—Diamond drilling for water on the 2000-ft. level has thus far given no results of consequence in the drainage of the Gold Hill group of mines. The drill hole is now out over 60 ft. from the bulkhead, the ground being so soft in places that it has been necessary to ream and case the hole.

Elko County

From the Hardscrabble lease near Golden Circle, 500 sacks of ore were recently shipped to Salt Lake City. The town is about 28 miles from the railroad so only high-grade ore can be profitably shipped. There is now talk of a custom mill being built; such a mill would enable several properties to be profitably worked and would encourage development work on some of the prospects.

Esmeralda County

Jackson Mountain—These claims have been sold by T. Rea to a Belgian syndicate that will start development work at once.

Florence—The shaft has been sunk to the 860-ft. level where swelling ground has delayed the work of drifting and station cutting.

Goldfield-Belmont—A deep shaft with three compartments is to be sunk on the Quartzite No. 1 claim.

Humboldt County

In the Red Butte district, drilling is being done to prospect for copper ore.

Black Hole—A suit has been started over the treatment of the tailing dump of this mine in the Chaffey district, 18 miles southwest of Winnemucca.

Big Four—This mine, 12 miles southwest of Imlay, was recently sold to J. Morjar, of Allegheny, Cal.

Lyon County

Mason Valley—A contract has been let for a sintering machine that will be used for preparing flue dust, fine ores and concentrates for smelting. The Pacific Live Stock Company has withdrawn the suit to enjoin operation of the smeltery.

White Pine County

Giroux—An explosion, on Aug. 24, at the 1200-ft. station, set fire to the timbers in the new shaft. Four men who were working at the bottom of the shaft, about 1400 ft. below surface, were killed coming through the fire on the cage. A water spray turned into the collar of the shaft caused a reversal of the draft, suffocating two men who were climbing the Alpha shaft. Two missing men were thought to be underground. The fire has been extinguished. Although the timbering at the station was destroyed, the shaft was not seriously damaged.

New Mexico

A reported discovery of asphaltum in the Zuni mountains in Valencia county has proved to be a deposit of a hard, black material formed by the action of moisture on a coal-bearing stratum.

Silver Jim—H. Mills, operating this property in the Organ district, has encountered a body of rich silver ore.

Lady Franklin—Sinking of a new shaft to tap the second contact is planned.

Sunset—The company has taken over under bond and lease the smeltery at Los Cerrillos and six claims, five miles west

of there in Santa Fé county. Development work has started on the Tom Payne mine, drifts will be extended and sinking of the main shaft will be resumed.

Economic—An orebody has been uncovered recently in this mine, eight miles southwest of Carrizozo. Installation of a small reduction plant is contemplated.

Mangas—A large amount of water is coming into the shaft being sunk at the property in Grant county. It is expected that larger pumps will be installed.

Memphis—Work has commenced at this property in Dona Ana county and the intention is to start a double-compartment shaft.

Wooton Land and Coal Company—The discovery of a seam of coal is reported on the company's land in the Raton mountains in Colfax county.

Ready Pay—Work of enlarging and retimbering the Larson shaft of this mine in Sierra county is progressing rapidly.

Oklahoma

Chapman & Lennan—This company has found ore on the Emma Gordon land, at Miami, at depths of from 224 to 325 ft., and the drill cuttings run 30 per cent.

Miami—A second and deep run of ore has been found in drill holes on the Turkey Fat, Miami Amalgamated and Consolidated leases at Miami. The ore is found at 200 to 250 ft., is rich and carries no iron. The Emma Gordon, Wauhilla and King Jack are preparing to drill on their leases for the same run. Shafts are being sunk on the Turkey Fat and Miami Amalgamated.

Oklahoma Lead and Zinc—This company is sinking two new shafts for the deep run on the lease northwest of the mill, and has installed another Church Bar centrifugal pump in the north shaft of the old lease.

Arbuckle District

The field is being prospected with churn drills and results are reported to be satisfactory. The presence of gold and silver has caused some excitement. Zinc and lead have been disclosed, but are believed to occur in a finely disseminated state, which will probably necessitate fine grinding in their treatment.

Oregon

There is considerable excitement at Bend, Crook county, over the discovery of gold in that vicinity, some of the ore assaying as high as $20 per ton, and being free milling.

Oregon Strong Ledge—A stamp mill and other machinery are being installed on this property near Murphy, Josephine county. Adolph Miller has charge.

Oriole—This company, operating in Josephine county, is considering the installation of a stamp mill. Fayette Jones, Grant's Pass, has charge.

Ogle Creek Mines—These mines, in Clackamas county, owned by Oregon city men, are being developed. The management will install a mill this season for the reduction of the ore.

South Dakota

Black Hills District

Leo—A body of pyritic ore, from which encouraging assays are returned, is being developed at this property south of Deadwood. A tunnel is being driven to intersect the main orebody.

Progressive—The property of the Safe Investment company has been purchased by this company, operating on Box Elder creek, and a shaft is sinking.

Tinton—This property, in western Lawrence county, is being investigated by engineers representing men who hold an option upon it. It is a tin proposition, carrying a little more than 0.5 per cent. tin, which at the present price makes it attractive.

Homestake—The Ellison shaft is a little over 1900 ft. deep. The next station will be cut at the 2000-ft. level. Below the 1100 level stations have been cut at intervals of 150 ft.; above that point they are 100 ft. apart.

Carbonate—Some high-grade ore is being taken from these mines, and a shipment will be made soon to Denver smelteries. The plans of the company include the construction of a small smeltery at an early date. A body of steel galena has lately been opened and the showing is encouraging.

North Homestake—Sinking is being continued, and the shaft is rapidly approaching the third station, which will be cut at 420-ft. depth. Four 2¼-in. Ingersoll-Rand drills are used in sinking this three-compartment shaft. Former shaft sinking has been done with two 3-in. machines, but the management expresses satisfaction with the new method.

Utah

Juab County

Sioux Consolidated—On the 600-ft. level the face of the drift is 35 ft. from its objective point, below the ore-bearing cave on the level above. Work has been somewhat delayed by the necessity of timbering the ground in the fissure which the drift is following.

Victoria—The shaft is being continued to the 1150 level. The bottom of the winze, 75 ft. below the 1050 level, is in mineralized quartz.

Tintic Standard—On the 700-ft. level a drift is following the contact through mineralized ground. The 1000-ft. level is expected to reach the contact of limestone and quartzite in a short time.

May Day—A shipment of 20 tons was made during the week from a recent strike on one of the leases, and another 50 tons will soon follow.

King William—Work has been suspended for the present as operations by way of the Eagle & Blue Bell have proved unsatisfactory. It is said that a new plan of development is being devised, for which money will have to be raised. The property is well situated, being surrounded by the Centennial-Eureka, Grand Central, Eagle & Blue Bell and Victoria.

Salt Lake County

Bingham-New Haven—A new compressor with a capacity of 750 cu.ft. per min. will be installed soon, enabling the mine to increase its output. Ore is being shipped at the rate of 250 tons per day. A new library and clubhouse, with bath and pool rooms, is being erected.

Alta Consolidated—This newly organized company has shipped its first consignment of ore.

Bachelor—The tunnel is in 500 ft., and drifting on the vein in mineralized ground is progressing at the rate of four feet per day.

Summit County

Little Bell—About 20 men are employed in the mine and on the dump. First-class ore is being mined on the 700-ft. level, and development is being done on the 300 and 500. Shipments of 50 tons per day of second class are being made.

Silver King Consolidated—The three-compartment working raise is up 98 ft., with a good showing. There is ore exposed in several places on the 1550- and 1600-ft. levels.

New York Bonanza—Raising is being done on the 300-ft. level, and carbonate ore is being taken out.

Tooele County

Galena King—This property at Stockton is being worked by the Tintic Leasing Company, and the first shipment of ore has been made.

Cliff—The trestle and loading station at St. John were destroyed by fire, July 8. The loss is covered by insurance, and will not seriously interfere with shipments. Two inclined shafts are being sunk; ore has been found in each.

Utah County

Waterfall—At this property, which adjoins the Mineral Flat, three teams are hauling lead-silver ore.

Pacific—Sinking is in progress and first- and second-class silver ore is being mined from development.

Yankee—Two teams are hauling ore from this property in Mary Ellen gulch.

Silver Flat—The surface showing is good, and development is being done at this property on Deer creek.

Dutchman—This company has shipped some ore in the past, and there is still much unprospected ground. Development is being done.

Washington

Twenty-six claims in the Mt. Baker district, Skagit county, belonging to Joseph Morovits, of Concrete, have been sold for $180,000 to a company of Eastern men, represented by C. Christopher, of Seattle.

White Elephant—Frank Ainsley, Orient, manager, is enlarging operations at this property in Ferry county.

Metaline Oriole—The returns from the first shipment of two cars of ore from this mine show a value of $50 per ton. More ore is blocked out ready for shipment. The property is near Metaline, Stevens county.

Bonanza—This property in Stevens county is being drained and will be developed by Paul Le Plant, of Bossburg, who has a lease on it.

Canada

British Columbia

Granby—The mines have been closed and the blast furnaces at the smeltery blown out. The published reason is, that owing to the strike in the Crow's Nest district, and the consequent cutting off of the coke supply from collieries in that district, the cost of obtaining coke is prohibitive at the present low price of copper. Not only are freight charges from Pennsylvania high, but coke is delivered in a less suitable condition for blast-furnace use, so large a proportion of it being broken in transit. The company, however, is pushing on with the development of its newly acquired Hidden Creek mine, at Observatory inlet, and is also erecting necessary mine buildings and making other surface improvements there.

British Columbia Copper—It is announced that after protracted negotiations extending over several years, favorable arrangements have been made with the Bank of Montreal, a coöwner of the property, for a resumption of ore production from the Emma mine, in the Boundary district. The ore contains copper and gold. In 1906, 11,000 tons shipped averaged $4.77 per ton. The mine is equipped with a power plant.

Ontario

Laurentian—This mine, in the Manitou Lake area, was recently closed down, owing to the company being in financial difficulties.

Ontario—Cobalt

The shipments from Cobalt for the week ended Aug. 18 were: La Rose, 403,560; McKinley-Darragh, 129,590; Beaver, 123,300; Drummond, 120,000; Buffalo, 66,150; Hudson Bay, 65,290; O'Brien, 64,040; Nipissing, 64,000; Coniagas, 62,760; Cobalt Lake, 61,600; Kerr Lake, 60,740; Right-of-Way, 60,550; Trethewey, 48,900; total, 1,330,480 pounds.

Beaver—A new high-grade oreshoot has been opened up on the 400-ft. level of this property.

Lucky Godfrey—Work was recently resumed at this property at Elk Lake, and an attempt made to find the vein, which was lost owing to a fault. A promising vein 6 in. wide has been struck, which is believed to be the one sought for.

La Rose—A statement for July, just issued, shows gross income, $172,881; operating expenses, $67,670; net profit, $105,121.

Ontario—Porcupine

Dome—Some important discoveries of veins showing free gold have been made on this property.

North Dome—A large quartz vein, returning good gold assays, has been discovered.

Imperial—Work was recently resumed on this property, which has been closed since the fire, and has resulted in the discovery of several new veins.

Porcupine Gold Mines—The mine has been pumped out and the surface equipment put in working order. No. 3 vein was resampled recently, with satisfactory results; an additional 10 ft. of mineralized schist was found on the north wall. This vein has also been encountered in the crosscut from the No. 2 workings. No. 2 vein has been drifted on for over 250 ft., the whole distance being reported in pay ore.

Rea—President C. Plummer Hill has issued an interim report stating that at the 200-ft. level the oreshoot is 50 ft. longer than it was at the outcrop. This level has been driven for 310 ft. It is the intention to sink to the 325-ft. level, and to continue the west shaft, which is now down 137 ft. The firm of Bewick Morey & Co. has been asked to resign its position as manager of the Rea, on the ground that as the company has the services of Mr. Kingsmill as engineer, the cost of mine management is unduly expensive.

Foley-O'Brien—A new mineralized zone, 75 ft. wide, has been found on the southern part of the property, with free gold showing. A shaft will be sunk and the vein prospected by drilling.

Mexico

Baja California

There is great activity in the San Antonio district at the present time. In spite of many setbacks caused by an excessively dry season, the usual rate of production is being maintained.

Compañia Metalúrgica de la Baja California—The new mill and cyanide plant are running continuously; regular monthly shipments of good-grade gold and silver precipitates are being made to the Selby smeltery in California. The process is crushing, grinding in chilean mills, separation by water classification, leaching of sands, and treatment of slimes in Pachuca tanks and Butters' filter press. Frank Lawrance is manager.

Chihuahua

Mines Company of America—Good results are attending development work at all the mines of this company, the Dolores, Creston-Colorado, El Rayo and La Dura. A new vein has been found at the Creston-Colorado; developments at La Dura have been particularly good, for the vein has been found on a new level 165 ft. lower than the previous lowest working.

San Cristobal—At this Parral mine 100 burros are used in transporting ore to the Veta Colorada mill. About 50 tons of ore per day are now being mined. It is expected that 300 burros will soon be used and that shipments will total 150 tons daily.

Durango

Compañia Minera de Peñoles—The two American foremen, against whom protests were made by the strikers, have resigned after the company had refused to discharge them. The strikers then returned to work. The report that the pumps were injured is denied.

Western Durango Mining and Developing Company—This company has been organized with $700,000 capital to work the Aguaje, El Fuerte, Catalina and other properties. John Allingham is in charge.

Hidalgo

Richard Honey, owner and operator of the Encarnacion rolling mills, has been granted a concession to establish an iron and steel works. It is proposed to smelt Hidalgo iron ore by electricity. The investment is not to be less than 1,000,000 pesos and within two years the production must not be less than 1200 tons of manufactured iron by the electric process. The plans and specifications for the plant are to be submitted to the secretary of fomento within four months.

Mexico

Santa Rosa Mining Company—At the mines of this company near Concepcion del Oro, the machinery for the mill has been received. Electric light and power is supplied from a producer-gas plant.

Bella Vista—Ore is being blocked out and plans for a 10-stamp mill are being drawn. It is stated that a French syndicate is interested in the property.

Seguranza—Bullion is being shipped from the mill at Zacualpan. Another tube mill and more vats are to be installed.

Oaxaca

San Juan de Taviche—A deep-level hoist is being installed and plans are being made for a 200-ton mill.

Escuadra—This mine is being examined for the Esperanza Mining Company, of El Oro, by a corps of engineers.

Veronica—This property of Foos Brothers is being examined for New York men.

The Markets

Coal Trade Review

New York, Aug. 30—The coal trade in the West reports variable conditions. General business does not seem to improve much and the demand for steam coal is about stationary as far as current business goes. There seems to be, however, a better disposition to stock up ahead, both in steam and domestic coals. Southern Illinois mines are generally pretty well employed, but other Illinois and Indiana mines are mining around 60 per cent. of capacity. The operators generally are more hopeful for the future.

Lake trade is in some confusion, as the docks in the Northwest are crowded with coal and there is much delay in unloading vessels. This has resulted in a short supply of boats at Lake Erie ports, and delay of cars there.

In the East bituminous trade is improving a little and there is a better tone to the market. Anthracite trade is fairly steady and without incident.

There was some expectation in the trade that the strikes in Great Britain might result in some demand for export coal here. So far, however, nothing has yet developed in this line.

Coal Traffic Notes

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, seven months ended July 31; short tons:

	1910	1911	Changes
Anthracite	6,391,011	6,787,754	I. 396,743
Bituminous	23,358,512	23,162,859	D. 195,653
Coke	8,278,953	6,064,148	D. 2,214,805
Total	38,028,476	36,014,761	D. 2,013,715

The total decrease was 5.3 per cent.; the loss being all in coke.

Coal shipments over Norfolk & Western railway in July, the first month of the fiscal year, in short tons:

Field:	Commercial	Company	Total
Pocahontas	1,062,085	75,014	1,137,099
Tug River	137,138	36,487	173,625
Thacker	151,599	46,037	197,636
Kenova	77,099	9,008	86,107
Clinch Valley	93,347	3,458	96,805
Total	1,521,268	170,004	1,691,272

As compared with July, 1910, the total shows an increase of 197,984 tons, or 13 per cent.

Anthracite shipments from Buffalo by lake for the season to Aug. 1 were 1,908,873 tons; an increase of 59,955 tons, or 3.2 per cent., over last year.

Coal passing through Sault Ste. Marie canals, season to Aug. 1, short tons:

	1910	1911	Changes
Anthracite	815,070	938,432	I. 123,362
Bituminous	5,425,430	5,899,591	I. 474,161
Total	6,240,500	6,838,023	I. 597,523

The total shows an increase of 9.6 per cent., which is a contradiction to reports of dull Lake trade coming from the Lake Erie ports.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal receipts at Boston, seven months ended July 31, reported by Chamber of Commerce.

	1910	1911	Changes
Anthracite	1,005,112	1,134,182	I. 129,070
Bituminous	2,370,421	2,383,637	I. 13,216
Total domestic	3,375,533	3,517,819	I. 142,286
Foreign	175,764	145,666	D. 30,098
Total	3,551,297	3,663,485	I. 112,188

The foreign coal is nearly all from Nova Scotia mines.

Bituminous coal tonnage reported over the Baltimore & Ohio railroad for the six months ended June 30 was 12,464,888 tons; a decrease of 2,363,875 tons from the first half of 1910, but an increase over the first half of 1909 of 2,334,653 tons.

Shipments of Broad Top coal over the Huntingdon & Broad Top railroad, seven months ended July 31, were 369,065 tons in 1910, and 357,696 in 1911; decrease, 11,369 tons.

Coal tonnage of Virginian railway in June was 245,625 tons, making a total for the six months ended June 30 of 717,393 short tons.

New York

Anthracite

Aug. 30—Trade is steady, and a fair tonnage is moving. There has not been any great rush to secure the last of the summer discounts on domestic sizes. Collieries are reported as running about two-thirds time for the most part.

On Friday of this week, Sept. 1, the summer discounts end and the regular prices take effect. Schedule quotations for domestic sizes for September are $4.75 for lump, $5 for egg and stove and $5.25 for chestnut; all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3@3.25; buckwheat, $2.20@2.70; No. 2 buckwheat or rice, $1.75@2.15; barley, $1.40@1.70; all according to quality, f.o.b. New York harbor.

The Department of Docks and Ferries has let a contract for 98,000 tons of pea coal for the use of the municipal ferries; the price is $3.49 per ton, delivered, South Brooklyn and Staten Island docks.

Bituminous

Trade seems to be looking up a little and dealers are in more hopeful mood. Harbor trade is still irregular, but New England buyers are beginning to think of next winter and are doing a little better. Deliveries on contract are improving. Supplies at tide have been kept down by shortage of cars on the Baltimore & Ohio and the West Virginia roads. That is largely due to the taking of cars for the Lake trade, however, and will probably be only temporary.

Prices remain about the same. A good quality steam coal costs $2.50, f.o.b. New York harbor; lower grades sell down to $2.30 and better up to $2.85. Gas coals are $1.15@1.20 for ¾-in. and $1.05@1.10 for run-of-mine at mines. Slack, however, is still too plentiful and sells at all sorts of prices.

Coastwise business is good and rates are rather firm. Going rates from New York are 55@60c. to Boston and Portland, with 10 or 15c. more to the shoal-water and towage ports; 35@40c. to Providence and Fall River; 25c. to Sound ports. From Philadelphia to Boston and Portland, 60@70c. is quoted. From Norfolk to Boston, 60@70c. is asked.

Birmingham

Aug. 28—The coal trade in Alabama is improving steadily and there is a better output all around. The orders on hand will require a large tonnage to fill. Some of the coal companies report sales having been made at a low price, but satisfactory in the face of conditions. The railroads have promised to furnish all transportation needed. Some of the larger companies in this district are already buying coal from smaller concerns to fill orders. The demand for coke is improving steadily. There are more coke ovens in blast now than at any time this year. There is to be a little accumulation of coke with an end in view of meeting a demand when more blast furnaces are blown in.

The Tennessee company is pushing the work on the Edgewater or No. 13 mines and before the end of the year will be getting out coal regularly at that place.

The railroads are beginning to consume more coal. Considerable coal is now moving to New Orleans, where shipping interests are being supplied with the product.

Chicago

Aug. 28—A fair and steady market exists for nearly all coals, steam and domestic, with shipments well regulated and supplies good except for a scarcity of

smokeless lump. The steam users are not taking large supplies but their buying is steady and the users of domestic bituminous coals are gradually increasing their purchases. The turning of the month probably will see a decided increase, for September is considered by many the buying month for needs until the end of the year. Country handlers of domestic are especially becoming busy regarding the probable demands caused by the first cool days. Screenings are in better demand again, but large supply and lessening demand are not likely to get this size back to its former level soon.

On cars Illinois and Indiana coals bring $1.85@2.35 for lump, $1.70@1.85 for run-of-mine and $1.45@1.60 for screenings, with the higher priced kinds more in favor. The passage to autumn conditions, indeed, is indicated by the better sale of good western lump. Of coals from east of Indiana Hocking seems to be in the best condition with the price held up to $3.15 by a good demand and well regulated shipments. Smokeless run-of-mine is plentiful at $3@3.15 and smokeless lump is scarce at $3.80@4.20. The anthracite market continues dull.

Cleveland

Aug. 28—Local trade is fair, and there is a better disposition to buy stocks ahead than has been seen for some time. Steam-coal trade is improving. Lake coal trade is in bad shape, as the docks at the upper ports are badly blocked and unloading is slow.

Prices are unchanged. Middle-district coal, f.o.b. Cleveland, is $2.15 for 1¼-in., $1.90 for ¾-in., $1.80 for mine-run, $1.50@1.60 for slack. No. 8 and Cambridge, 5 or 10c. higher. Youghiogheny is $2.45@2.50 for lump and $2.20@2.25 for run-of-mine.

Indianapolis

Aug. 28—A new block of 140 byproduct coke ovens of the Steel Corporation's Gary plant has been placed in operation. There are now in operation four batteries, 280 ovens, and these will be increased by the two batteries just completed. Two other batteries of 140 ovens are under way and when these are in operation Gary will have 560 byproduct ovens built at a cost of nearly $8,000,000. The placing of the two new batteries means a corresponding increase in the production of gas and byproducts.

Pittsburg

Aug. 29—Shipments in the Lake trade are unchanged, but a heavier rate is expected next month, shipments thus far having been below the requirements, on account of the difficulty in getting vessels. August promises to show a gain over July. Demand for domestic coal has not improved, but is expected to be good next month. Prices are fairly well maintained, and we quote: Nut, $1.10@1.15; mine-run, $1.15; ¾-in., $1.25; 1¼-in., $1.35; slack, 60@75c. per ton at mine.

Connellsville Coke—The market has been quiet and is a trifle less firm, so that we quote prompt furnace at 5c. less than last week and note that at former asking prices for balance of the year buyers have not taken hold, making it doubtful whether any business can be done. For instance, in the past week one consumer who had a price of $1.65 for the last four months of the year on furnace coke bought 8500 tons for September shipment, at $1.55, and expects to buy for the next three months at a price which will make a considerably better average for the four months than $1.65. Foundry coke business is slack. We quote: Prompt furnace, $1.50@1.55; contract furnace, $1.65@1.70; prompt foundry, $1.85@2; contract foundry, $2@2.25 at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville regions in the week ended Aug. 19 at 313,722 tons, a gain of 10,000 tons, and shipments at 3493 cars to Pittsburg, 4636 cars to points west and 923 cars to points east, a total of 9052 cars.

St. Louis

Aug. 28—The market for the past week has shown a slight improvement; domestic lump and all the prepared sizes were in fair demand, with prices in general having an advancing tendency. Screenings, on the other hand, have remained stationary, though they are in good demand at the prevailing prices, and it seems that the present prices will probably remain unchanged on screenings for some time to come.

Current prices are as follows in the St. Louis markets:

Standard:	F.O.B. Mine	F.O.B. St. Louis
6-inch lump	$1.05	$1.57
2-inch lump	0.90	1.42
2-inch nut	0.70	1.22
2-inch screenings	0.35	0.87
Mt. Olive, Staunton, Springfield:		
6-inch lump	1.40	1.92
2-inch lump	1.25	1.77
2-inch screenings	0.40	0.87
Trenton:		
6-inch lump or egg	1.90	2.42
3-inch nut	1.50	2.02
Carterville:		
6-inch lump or egg	1.35	2.02
3-inch nut	1.20	1.87
2-inch screenings	0.50	1.17
Franklin County:		
6-inch lump	1.40	2.07
3-inch nut	1.25	1.92
Anthracite:		
Chestnut		7.10
Stove or egg		6.85
Grate		6.60
Smokeless:		
Lump or egg	2.00	4.50
Mine-run	1.10	3.60

Prices on Illinois soft coal for E. St. Louis, Madison or Granite City, Illinois, are 20c. per ton less than St. Louis prices.

While the bulk of the tonnage is coming from the Standard field, yet operators are disappointed with present market conditions. The price on screenings dropped a great deal faster than the price on lump increased, consequently it will take a considerable advance on lump coal to put the market where there is any profit worth mentioning to the operators. Carterville coal is in good demand and there has been a general advance of 10 to 15c. per ton on all domestic sizes, steam coal and screenings remaining unchanged.

It seems early in the season to raise the cry of car shortage, but nevertheless complaints have been heard from several directions already.

Anthracite—Coal is in much better demand and all sizes are moving freely again. Chestnut in particular is called for.

FOREIGN·COAL·TRADE

Nova Scotia—Coal shipments from mines, seven months ended July 31, long tons:

Company	1910	1911	Changes	
Dominion	1,618,311	1,929,360	I.	311,049
Nova Scotia Steel	414,051	340,451	D.	73,600
Acadia	143,185	220,617	I.	77,432
Intercolonial	142,658	146,086	I.	3,428
Inverness	145,905	152,122	I.	6,217
Total	2,464,110	2,788,636	I.	324,526

The total increase was 13.2 per cent. Only one company shows a decrease this year.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal on Aug. 12, as follows: Best Welsh steam coal, $4.56; seconds, $4.20; thirds, $3.96; best dry coals, $4.02; best Monmouthshire, $3.84; seconds, $3.69; best small steam coal, $2.46; seconds, $2.04. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, Aug. 30—The iron and steel markets show no material change from recent reports. There seems to be still some hesitation about making heavy commitments for the future and the disposition is still to buy chiefly for short deliveries. This has been the tendency for some time and it is rather difficult to change it. Prices are not particularly firm, and shading is going on in several lines, though cuts are not very deep. The Steel Corporation is said to be working about 75 per cent. of its capacity; the larger independents vary from 70 to 80 per cent.

In finished material structural steel is prominent, chiefly with orders of moderate size, though larger ones are not altogether wanting. Railroad-equipment orders are improving and there is a good deal of bridge work forward. Plates and sheets show the general conditions of small orders, making up a pretty good

total. In brief, there is a large volume of business, but chiefly for early delivery.

Pig iron is under the same influences. Foundry iron is being taken rather more freely, and there is a good demand for moderate lots of basic. Furnace capacity active is increasing a little, though there are still some stocks to be disposed of. There is much less pressure to sell Southern foundry than there has been, and prices are less easy, though they have not advanced.

United States Steel Corporation—President Farrell on Aug. 29 issued the following encouraging statement: "The unfilled orders as at Aug. 1 showed 3,584,000 tons (exclusive of intercompany business of 850,000 tons), a gain over June 30 of 225,000 tons. Since Aug. 1 new business has been freely offered, and notwithstanding shipments in August have been large, the bookings up to Aug. 20 (the latest date to which data has been compiled), show a fair increase. The steel-producing plants of the corporation are operating about 78 per cent. of their capacity, while a number of the finishing departments of the various companies are operating 85 per cent. The daily bookings of the corporation from Jan. 1 to Aug. 20 show an average increase of 7750 tons, as compared with the same period in 1910. Specifications for prompt shipments in August are larger than for any previous month this year, and the outlook is all that can be desired."

The orders on the books at the first of the month made the heaviest tonnage since July 31, 1910.

Baltimore

Aug. 28—Exports for the week included 112,026 lb. lead to Belfast, Ireland; 56,160 lb. steel wirerods and 2,706,300 lb. steel billets to Liverpool. Imports included 1425 tons spiegeleisen and 1077 tons ferromanganese from Middlesboro, England; 60 casks manganese ore from Hamburg; 12,500 tons iron ore from Cuba.

Birmingham

Aug. 28—The month of August saw a better business with the Southern pig-iron manufacturers than any month of the year, and the reduction of stocks of accumulated iron was satisfactory. A few sales are still being made on a basis of $10.50 per ton, No. 2 foundry. Some manufacturers are quoting $1[illegible] per ton and are offering delivery at this price into next year. As far as can be learned, but few orders have been received for iron to be shipped in 1912. The inventory of iron on hand will show next week a lower quantity than for some time.

There is still some activity in the steel industry. The Southern Iron and Steel Company, at Gadsden, has more of its plants in operation now. The steel-rail business is stronger and shipments are being made promptly.

The cast-iron pipe trade is good. The Dimmick pipe plant, at North Birmingham, will be started up some time during the coming month.

The scrap-iron dealers are doing a better business now. The charcoal-iron people are selling slowly at the same price, $22.50 per ton.

The Tennessee company during the past week blew in Alice furnace, and the increased production will be in basic iron to meet demands at the steel plants.

Chicago

Aug. 28—The pig-iron market is quiet and there are no indications that it will change soon. Buying of both Southern and Northern iron in foundry grades continues in numerous small lots for last quarter, first quarter and first half. Local melters are cautious, prefering yet to buy often and to sound the market at intervals with inquiries about large lots. Southern No. 2 sells for $10.25@10.50—some few lots perhaps 25c. lower—Birmingham, which means $14.60@14.85 Chicago. Northern No. 2 brings $14.50@14.75 at local furnaces, and Lake Superior charcoal $16.50@17. The higher prices are asked on first-half deliveries and there is no urgent effort to sell or to buy at them, in small quantities, both buyers and sellers prefering to await developments of the market while doing business in small lots for earlier delivery.

In iron and steel products the market continues good, notably in structural material and railroad supplies. Coke is in better demand at $4.60@4.75, Chicago.

Cleveland

Aug. 28—Some small sales of ore are reported, but business is quiet. The contract boats are more than able to handle the tonnage going, and no wild boats are employed.

Pig Iron—There are a number of small sales, but no large contracts are on the carpet. Foundries are doing a fair business. Quotations, Cleveland delivery, are $15.90 for bessemer; $14@14.25 for No. 2 foundry; $14.35 for No. 2 Southern; $17.50 for Lake Superior charcoal.

Finished Material—Some fair contracts have been closed for structural and bridge steel. Bars are quiet and sheets rather slow, but quite a number of small orders for plates are coming in. Reports of shading on prices are current, but cannot be confirmed.

Philadelphia

Aug. 30—A disappointing volume of business has been done in this territory during the last week. Several big deals have been suddenly called off; there are no rumors to indicate any reason. Prices are admittedly at their lowest. Southern furnaces are not causing any friction. Large consumers are less disposed to close for iron this week than last. Ready stocks at furnaces are low. All the business heard of is for early shipment. Large consumers have tentatively inquired for 1912 iron, but very little has come of it, and makers are not running after such business as they are in hopes of doing better when fall developments become manifest. The everyday demand is good. Foundries and other consuming interests are all fairly well engaged. The Baldwin Locomotive strike has collapsed and the strikers are rushing for work. Steel irons are fairly strong; forge and foundry relatively weak. Basic pig is strong. No. 2 X foundry is $15; gray forge, $14.50; basic is shaded from $15 per ton.

Steel Billets—The week's business indicates that some backward buyers have decided to take hold.

Bars—Some mill owners claim to have done a good week's business, particularly in common iron, which is now in better inquiry.

Sheets—The sheet situation continues to improve in business for early delivery, particularly for heavy and galvanized sheets.

Pipes and Tubes—A few scattering orders have been placed and the outlook is good.

Plates—Heavy orders for steel plates are going to the mills with instruction in many cases for early delivery.

Structural Material—This week's business consists of small orders running into a few hundred tons, for small bridge work mostly. A large volume of big business is hanging fire. The structural mills are in good shape, with an 80 per cent. output.

Scrap—The scrap market is very quiet and prices are weak.

Pittsburg

Aug. 29—For another week the iron and steel market has lost ground. Specifications in finished-steel products on contracts have been only fair, while new buying has been distinctly lighter. There seems to be no backbone to the market, prices being still softer at several points. The mills are operating much better than in July but this does not make them a particle less eager for additional tonnage and point by point the price level sags. In the past week the most noteworthy break was in wire prices, in which quotations are now openly $1 a ton below the card prices. The reduction is an open one, although mills state that their card prices are not changed, whatever that may mean. The open reduction replaces irregular cutting which was a feature for several weeks, new prices being: Wire nails, $1.65 per keg, base; plain wire, 1.45c., base; painted barb wire, 1.65c.; galvanized barb wire, 1.95c. The new

prices are lower than any which have prevailed since the great break of 1909. During 1910 there was a decline of $3 a ton, while in January and March of this year there were two advances of $1 each, May 29 seeing a reduction of $2.

Tinplate is being openly offered at $3.60 on desirable business both for prompt shipment and on contracts through the first quarter of the year, or 10c. per base box under the nominal market. There has been shading for several weeks and the open quotation of $3.60 represents an effort to rally around a definite figure and avoid further losses. Sheets are being more regularly shaded than formerly. Merchant pipe is being shaded in a limited way, and there are predictions that an open reduction, probably of one point or $2 a ton, will be announced about Sept. 1.

Pig Iron—Struthers furnace, Struthers, O., blew in Saturday on basic iron, making seven of the 18 merchant furnaces in the Valley in operation, three on basic, two on bessemer, one on foundry and one on forge. Shipments have been materially in excess of production, and with an additional furnace in blast will still be in excess, but one large interest consuming merchant basic iron is having shipments reduced. Nothing important marketwise has occurred in the past week, sales being very light. The purchases of foundry iron by the Standard Sanitary Manufacturing Company for fourth-quarter delivery, mentioned in last report as totaling about 7000 tons, prove to have aggregated 11,000 tons. The iron for the New Brighton plant brought $13.50, Valley, for No. 2 foundry, and $13 for both No. 3 and gray forge, the latter being specified under 0.05 per cent. in sulphur. The iron for delivery at Allegheny was at $14.15 delivered, for No. 2, $13.90 for No. 3 and $13.75 for gray forge, the iron coming from furnaces having less than the Valley freight. We quote: Bessemer, $15; basic, $13; No. 2 foundry, $13.50; malleable, $13.25 @13.50; gray forge, $13, all at Valley furnaces, freight to Pittsburg being 90c., but on foundry-iron furnaces having less than the Valley rate will cut the Valley price delivered Pittsburg by 15 to 25 cents.

Ferromanganese—The market has been quiet, with $37, Baltimore, quoted regularly for prompt and forward delivery, but odd lots for prompt shipment can generally be picked up at $36.50 or $36.75, Baltimore.

Steel—A few odd lots of steel may have been sold under the regular prices, but no important tonnage. Shipments on contracts are fairly satisfactory, slightly exceeding the July average. We continue to quote billets at $21 and sheet bars at $22, f.o.b. maker's mill, Pittsburg or Youngstown.

Sheets—Price shading has not increased in depth, but has increased geographically, $2 a ton under the nominal prices on black sheets being now possible over a wide territory, on particularly desirable business. On account of the high price of spelter, galvanized sheets are not shaded as much, generally only $1 a ton, to 2.95c. for No. 38 gage. On attractive lots for early shipment 2.90c. is occasionally done. As the regular prices have become purely nominal, we quote the actual market as follows: Black sheets, 28 gage, 1.90@1.95c.; galvanized, 2.95c.; blue annealed, 1.45c.; painted corrugated, $1.35 per square; galvanized, $2.50. Even these prices are shaded slightly in extreme cases.

St. Louis

Aug. 28—Pig iron was in slightly better demand this week as a number of small contracts, and several of fair size were closed. Demand for finished steel products seems quite brisk and a number of mills which have been running spasmodically all summer are getting ready to go on full time after Sept. 1. The current prices remain about the same—$10@10.25, Birmingham, or $13.75@14 St. Louis for No. 2 foundry. Producers are beginning to hold out for the higher figure.

METAL MARKETS

New York, Aug. 30—The metal markets generally show little change. Current demand is fair, but the disposition is still to buy only for early deliveries in most lines. The spelter market remains in an unsettled and nervous condition.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold:			
July 1911..	$2,178,088	$ 2,594,653	Imp.$ 416,565
" 1910..	828,451	10,282,649	Imp. 9,354,198
Year 1911..	15,429,650	36,367,679	Imp. 20,938,029
" 1910..	50,345,182	29,671,180	Exp. 20,674,002
Silver:			
July 1911..	5,275,008	3,920,794	Exp. 1,354,214
" 1910..	5,124,471	3,794,888	Exp. 1,329,583
Year 1911..	39,718,211	25,881,395	Exp. 13,836,816
" 1910..	32,178,689	25,696,408	Exp. 6,482,281

Exports from the port of New York, week ended Aug. 26: Gold, $9200; silver, $685,760, chiefly to London. Imports: Gold, $502,481, from Mexico and the West Indies; silver, $28,943, from Central America.

Gold—The price of gold on the open market in London continued at the normal level, 77s. 9d. per oz. for bars and 76s. 4½d. per oz. for American coin. The Bank of England took about half the supplies, the rest being divided between India and Berlin.

Platinum—The market is firm at the advanced price. Dealers ask $45 per oz. for refined platinum, and $47.50 per oz. for hard metal, 10 per cent. iridium.

Our Russian correspondent writes, under date of Aug. 17 that the market is strong and prices higher. A scarcity of platinum in the field is reported from the Urals. At Ekaterinburg small lots are quoted at 9.50 rubles per zolotnik—equal to $35.72 per oz.—for crude metal, 83 per cent. platinum. At St. Petersburg the same grade is quoted at 36,800 rubles per pood—equal to $36.06 per oz.; but this price is subject to negotiation.

Silver—The market has remained steady around 24⅛d. in London. This steadiness is due to Chinese orders, notwithstanding lack of demand from India. In addition to the requirements of China there has arisen a considerable demand for Russia and South America. The market closes steady.

SILVER AND STERLING EXCHANGE

Aug.	24	25	26	28	29	30
New York....	52⅛	52⅛	52⅛	52⅛	52¼	52¼
London.....	24⅛	24 1/16	24⅛	24 1/16	24⅛	24⅛
Sterling Ex..	4.8605	4.8600	4.8605	4.8600	4.8605	4.8600

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, from Jan. 1 to Aug. 17, reported by Messrs. Pixley & Abell:

	1910	1911	Changes
India.....	£4,062,100	£5,100,600	I. £1,038,500
China.....	1,113,500	890,400	D. 223,100
Total.....	£5,175,600	£5,991,000	I. £815,400

India Council bills in London brought an average of 16.04d. per rupee. Silver shipments for the week were restricted by the strike of the dockmen in London.

The Treasury Department's estimate of gold in the United States on Aug. 1 is as follows: Held against gold certificates outstanding, $991,457,669; in Treasury current balances, $182,418,614; in banks and circulation, $590,230,820; total, $1,764,107,103, an increase of $8,843,458 during July.

Copper, Tin, Lead and Zinc

NEW YORK

	Copper		Tin	Lead		Zinc	
Aug.	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
24	12¼ @12⅝	12.35 @12.40	43	4.50	4.37½ @4.40	5.95 @6.00	5.80 @5.85
25	12½ @12⅝	12.35 @12.40	43	4.50	4.37½ @4.40	5.90 @5.95	5.75 @5.80
26	12½ @12⅝	12.35 @12.40	43⅛	4.50	4.37½ @4.40	5.85 @5.95	5.70 @5.80
28	12½ @12⅝	12.30 @12.35	43⅛	4.50	4.37½ @4.40	5.85 @5.95	5.70 @5.80
29	12½ @12⅝	12.30 @12.35	42¾	4.50	4.37½ @4.40	5.85 @5.90	5.70 @5.75
30	12⅝ @12⅝	12.30 @12.35	42¾	4.50	4.37½ @4.40	5.85 @5.90	5.70 @5.75

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Aug.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
24	56⅛	56⅛	60½	188¼	185⅞	14 3/16	27¾
25	56	56⅜	60¼	188½	186⅛	14¼	27¾
26	.....	.....	.....	.....	.....	.....	.....
28	56 1/16	56⅜	60¼	190⅛	187½	14¼	27⅞
29	56 1/16	56⅛	60¼	190¼	187¾	14¼	27⅞
30	56	56⅝	60¼	189¼	186¾	14 3/16	27⅞

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.40c. ± £1 = ± 0.21¾c.

Copper—In view of the uncertainty of the outlook in general, there has been more eagerness to find a market for copper in a larger way than has been the case during recent weeks, and there is some disposition on part of producers to make concessions. Fair-sized transactions have taken place, both for export and home trade, at receding figures. The close is barely steady at 12½@12⅝c. for Lake copper, and 12.30@12.35c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 12@12⅛ cents.

Copper sheets are 18@19c. base, for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 13¾c. base, carload lots at mill.

The standard market has been marking time. Quotations throughout the week are, so as to speak, stationary. The close is lifeless at £56 for spot, and £56 12s. 6d. for three months.

Exports of copper from New York for the week were 3385 long tons. Our special correspondent gives the exports from Baltimore for the week at 230 tons.

Details of the visible stocks of copper in Europe on Aug. 15 are as follows: Stocks in Great Britain, 52,587 long tons; France, 5658; afloat from Chile, 1950; afloat from Australia, 6350; estimated stocks in Rotterdam, 7800; in Hamburg, 10,800; total, 85,145 tons. As compared with July 31 there was a decrease of 1480 tons in French and English stocks, but an increase of 650 tons at Rotterdam and Hamburg.

Tin—The market in London was firm throughout the week under review, without, however, developing any special features. Quotations advanced from day to day, but close somewhat reactionary at £189 5s. for spot, and £186 15s. for three months.

Buying on the part of domestic consumers was reported for September delivery at prices which were close to the import basis. On account of dullness in trade and some offering of outside brands of tin, the spot situation eased considerably, the premium declining to about 1c. per lb. At the close, spot tin is quoted at about 42¾c. per lb., while September delivery can be bought at about 41¾ cents.

Lead—Business has quieted down, but so far the last quotations have been well maintained, and the market closes at 4.50c., New York, and 4.37½@4.40c., New York.

The improvement in the foreign market has made further progress and the close is strong at £14 6s. 3d. for Spanish lead, and £14 8s. 9d. for English.

Spelter—There has been an effort on the part of some smelters and small dealers to market spelter for future delivery, but as there is no inclination on part of consumers to anticipate their wants at the present time, these efforts have met with little success, except to bring about a rather lower level of prices. The close is uncertain at 5.70@5.75c., St. Louis, and 5.85@5.90c., New York.

There has been another slight advance in the London market, which is quoted firm at £27 17s. 6d. for good ordinaries, and £28 2s. 6d. for specials.

The St. Louis and London prices for spelter are now about at parity, perhaps a little in favor of St. Louis. Consequently, some interesting development is soon to be expected; either a recovery in our price, an exportation to Europe, or a recession in the European price.

Zinc dust is quoted this week at 7½c. per lb., New York.

Base price of zinc sheets is $8 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—Sales are not large and the market remains quiet. Current quotations are 19¾@20c. per lb. for No. 1 ingots, New York.

Antimony—The market continues very dull, with scarcely more than a retail business doing. Quotations are rather weak. Cookson's is 8.25@8.37½c. per lb., and Hallett's 7.75@8c.; while 7.25@7.50c. per lb. is quoted for Chinese, Hungarian and other outside brands.

Quicksilver—Business continues fair, and there is no change in prices. New York quotations are $48 per flask of 75 lb., with the usual advances for small quantities. San Francisco, $47@47.50 for domestic orders and $44.50@45 for export. London price is £9 per flask, with £8 17s. 6d. quoted from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Cadmium—The last quotation was 700@725 marks per 100 kg.—75.5@78.3c. per lb.—at works in Germany, according to quantity.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@50c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 26—The highest price paid for zinc sulphide ore was $48 per ton, the base $42@45 per ton of 60 per cent. zinc. Zinc silicate sold at $23@25 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $42.94. As high as $64.30 was the settling price on one bin of lead ore, and offerings of $64 were reported from several producers. This is a recoup from a week ago to conditions prevailing two weeks ago. The average price, all grades of lead, was $60.80 per ton.

Local papers have this week devoted space to the enumeration of the several large piles of ore held in reserve for a base price of $50 per ton of 60 per cent. zinc, and have assiduously classed it as surplus stock. As current prices are be-

SHIPMENTS, WEEK ENDED AUG. 26

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	2,719,390	.....	1,114,990	$92,422
Joplin.....	2,062,450	.....	205,030	51,626
Duenweg.....	754,230	59,750	.....	16,991
Galena.....	434,040	.....	166,710	14,415
Oronogo.....	370,370	.....	173,590	12,927
Granby.....	142,680	306,220	31,980	7,530
Spring City..	60,380	212,650	38,330	5,200
Aurora.....	129,620	127,170	.....	4,385
Cave Springs.	194,480	.....	.....	4,278
Miami.....	199,690	.....	.....	3,594
Alba-Neck....	124,490	.....	.....	2,862
Quapaw.....	128,410	.....	.....	2,568
Carl Junction	59,490	.....	.....	1,398
Jackson.....	62,860	.....	.....	1,320
Lawton.....	61,130	.....	.....	1,314
Totals.....	7,503,710	705,790	1,730,630	$222,830
8 months ..	326,772,490	22,324,480	57,971,230	$8,352,161

Blende val., the week, $161,189; 8 months, $6,447,729
Calamine, the week, 9,028; 8 months, 361,682
Lead value, the week, 52,613; 8 months, $1,642,750

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1910	1911	1910	1911	1910	1911
January.....	$47.31	$41.85	$45.16	$40.55	$56.99	$55.68
February....	40.69	40.21	39.47	39.16	53.64	54.46
March.....	43.60	39.85	39.71	38.45	51.26	54.57
April.....	41.00	38.88	39.33	37.47	49.72	56.37
May.....	40.19	38.25	37.51	36.79	48.16	55.21
June.....	40.20	40.50	37.83	38.18	48.80	56.49
July.....	39.63	40.75	36.80	38.36	48.59	58.81
August.....	40.13	.....	37.32	.....	49.75	.....
September..	43.45	.....	39.96	.....	54.73	.....
October.....	43.31	.....	40.50	.....	53.18	.....
November...	47.20	.....	43.20	.....	54.80	.....
December...	42.50	.....	40.70	.....	55.70	.....
Year.....	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

low this level, with no present indication of reaching a $50 base, it is unfair to class such reserved ore as a surplus. It is in the hands of producers who have been holding it for months and are amply able to continue holding it, and being an unmarketable quantity it can have no such bearing on prices at the present level as a surplus accumulation.

Platteville, Wis., Aug. 26—The highest price paid this week for zinc ore was $45; the base price was strong at $43@44. The base price paid for 80 per cent. lead ore was $57@58 per ton.

SHIPMENTS, WEEK ENDED AUG. 26

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	717,740	.....	516,660
Mineral Point	603,420	.....	.....
Harker	525,360	.....	.....
Highland	514,700	.....	.....
Benton	390,300	.....	80,000
Hazel Green	243,800	40,000	.....
Rewey	67,000	.....	.....
Shullsburg	.....	50,000	.....
Total	3,062,320	90,000	596,660
Year to date	100,420,299	5,491,625	20,809,850

Shipped during week to separating plants, 2,846,060 lb. zinc ore.

Other Ore Markets

Manganese Ore—Recent quotations for manganese ore in Great Britain are as follows: Indian and Brazilian ore, 50 per cent. manganese, 9¼@9½d. per unit; 48 per cent., 9d. per unit. Caucasus ore, 50 per cent., 7¾d.; 48 per cent., 7½d. per unit. All quotations are c.i.f. British port. These quotations compare with 25c. per unit, delivered at mill, for a 49 per cent. ore in the United States.

CHEMICALS

New York, Aug. 30—The general markets are quiet, the summer depression having not yet passed over.

Copper Sulphate—Business is rather slow and prices are unchanged at $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Arsenic—The market is still rather firm and manufacturers of insecticides are still inquiring about contracts for next year. Prices are unchanged at $2 per 100 lb. for spot lots of white arsenic and $1.75 per 100 lb. for futures.

Nitrate of Soda—Current business is fair and prices have firmed up slightly. Quotations are 2.17½c. per lb. for spot nitrate and for deliveries through the balance of 1911; while 2.20c. per lb. is asked for 1912 deliveries.

Potash Salts—Exports of potash salts from Germany, for the half-year ended June 30, were, in metric tons:

	1910	1911	Changes
Kainit, kieserit, etc.	536,458	513,935	D. 22,523
Potassium chloride	136,696	154,949	I. 18,253
Potassium sulphate	33,775	51,057	I. 17,282
Pot.-magnesium sul.	96,163	127,540	I. 31,377
Total	803,092	847,481	I. 44,389

The total exports to the United States included above were 472,303 tons in 1910, and 467,079 in 1911; decrease, 5224 tons. The decrease was entirely in kainit and the other crude salts.

Petroleum

Exports of mineral oils from the United States, seven months ended July 31, in gallons:

	1910	1911
Crude petroleum	64,171,176	67,724,870
Naphthas	47,337,779	59,779,023
Illuminating oils	536,162,245	650,580,578
Lubricating and paraffin	90,547,221	99,362,001
Residuum	61,191,487	66,052,204
Total	799,409,908	943,498,676

The total increase this year was 144,088,768 gal., or 18 per cent.

MINING·STOCKS $

New York, Aug. 30—The fall in quotations and the general liquidation noted last week continued through the greater part of the present week. Toward the close, however, there was a rally of considerable proportions, and a better resistance to the selling pressure. Gains were made in a number of prominent stocks, U. S. Steel and Amalgamated Copper being among the leaders. The market remains largely professional still, the public taking only a moderate interest.

On the Curb much the same course was followed. At the close the copper stocks showed some gains over the low points made earlier in the week. Ray Central, Giroux and Inspiration made gains, but Greene-Cananea was again off in price. Cobalt stocks were stronger and there was good buying of Nipissing, Kerr Lake and La Rose. Porcupine issues were not generally active. Other mining stocks were rather quiet and irregular.

Boston, Aug. 29—Another bad week characterized the copper-share market but it now seems to have adjusted itself. Following the Amster trouble came that of S. R. Dow, who promoted such companies as Algomah, Indiana, North Lake and Corbin Copper. Through circumstances this gentleman became involved and a small-sized panic was precipitated by throwing over blocks of these stocks which were in the banks and in brokers' hands. Following so close upon the Amster affair this gave the market a sorry showing and copper stocks sold the lowest of the year—in many cases for a longer period. Mr. Dow is also president of the Franklin mine and that stock was also slaughtered. All of the Dow stocks, with the exception of Franklin, are prospects and only recently a $2 assessment was paid on the latter stock.

Arizona Commercial made a low at $1.87½ and Boston Corbin at $3.75. Shannon sold as low as $8. Other stocks to show breaks were Calumet & Arizona, Copper Range, Mohawk, North Butte, Old Dominion, Osceola and Utah Consolidated.

Naturally the Curb market sympathized with these breaks, although Davis Daly showed strength. South Lake broke $2.37½ to $3.62½ and United Verde Extension halved its price by touching 30c. per share.

Calumet & Hecla directors have de-

COPPER PRODUCTION REPORTS

Copper contents of blister copper, in pounds

Company	May	June	July
Alaska shipments	3,092,000	.....	.....
Anaconda	22,100,000	21,850,000	21,900,000
Arizona, Ltd.	2,800,000	2,700,000	2,750,000
Balaklala	978,426	.....	.....
Copper Queen	7,140,196	7,088,862	6,373,062
Calumet & Ariz.	3,854,000	3,656,000	4,394,000
Detroit	1,709,530	1,732,692	1,590,357
East Butte	1,135,000	841,200	.....
Mammoth	.....	.....	1,598,082
Nevada Con.	5,277,355	5,307,400	5,258,582
Old Dominion	2,363,000	1,907,000	2,114,000
Shannon	1,229,760	1,098,000	1,150,000
South Utah	318,350	158,661	254,462
United Verde*	3,000,000	3,000,000	3,000,000
Utah Copper Co.	8,391,879	7,908,685	7,555,407
Lake Superior*	19,000,000	19,800,000	17,060,000
Non-rep. mines*	10,188,000	14,625,000	16,800,000
Total production	92,577,496	91,673,500	.....
Imports, bars, etc.	19,481,190	22,348,964	.....
Total blister	112,058,686	114,022,464	.....
Imp. in ore & matte	6,801,365	4,744,912	.....
Total	118,860,051	119,767,376	.....
Brit. Col. Cos.:			
British Col. Copper	976,121	.....	.....
Granby	1,238,328	.....	.....
Mexican Cos.:			
Boleo	2,411,500	2,315,040	1,973,680
Cananea	4,098,000	3,462,000	3,994,000
Moctezuma	2,403,583	2,071,960	2,340,404
Other Foreign:			
Cape Cop., S. Africa	1,001,280	.....	.....
Spassky, Russia	586,880	542,080	672,000
Exports from:			
Chile	7,392,000	3,960,000	7,168,000
Australia	11,088,000	7,168,000	7,056,000

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export
VII, 1910	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424,316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II	109,828,297	50,518,998	45,111,019
III	130,532,080	66,080,789	59,081,127
IV	118,085,223	52,407,650	62,129,599
V	126,962,544	64,543,963	61,978,557
VI	124,554,312	61,655,561	71,460,519
VII	112,167,934	56,982,582	74,880,658

VISIBLE STOCKS.

	United States.	Europe.	Total.
VIII, 1910	170,640,678	222,320,000	392,960,675
IX	168,881,245	218,444,800	387,326,046
X	148,793,714	211,276,800	360,070,519
XI	139,261,914	198,060,800	337,322,711
XII	130,389,069	193,200,000	323,589,095
I, 1911	122,030,195	236,629,120	358,649,373
II	142,439,490	236,992,000	379,431,134
III	156,637,770	233,385,600	390,023,009
IV	162,007,934	223,014,400	385,022,434
V	165,555,908	212,284,800	377,840,708
VI	165,995,932	202,540,800	368,536,732
VII	157,434,164	195,932,800	353,366,964
VIII	137,738,858	191,891,840	329,630,698

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. From Jan. 1, 1911, stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

clared a quarterly dividend of $6, the same as the last payment, and Calumet & Arizona directors declared the regular quarterly dividend of $1 per share. Quincy mining officials state that there is no danger of a reduction in the dividend rate.

Assessments

Company	Delinq	Sale	Amt
Best & Belcher, Nev	Sept. 4	Sept. 25	$0.05
Bonanza Mountain, Ida	Aug. 15	Sept. 9	0.001
Calumet, Ida	Aug. 15	Sept. 15	0.001
Cedar Creek, Ida	Aug. 9	Sept. 9	0.C03
Challenge, Nev	Aug. 17	Sept. 7	0.05
Con. Virginia, Nev.	Sept. 9	Sept. 13	0.25
Copper King, Ida	Aug. 15	Sept. 16	0.01
Dalmatia, Ida	Aug. 3	Sept. 4	0.10
Douglas, Ltd., Ida	Aug. 25	Sept. 26	0.002
Hale & Norcross, Nev	Aug. 30	Sept. 20	0.05
Melcher, Ida	Aug. 26	Sept. 15	0.00½
New York-Bonanza, Utah	Sept. 8		0.02
Overman, Nev	Sept. 12	Oct. 3	0.05
Pretoria, Ida	Aug. 15	Sept. 15	0.000½
Savage, Nev	Aug. 22	Sept. 12	0.10
Seven Troughs Mon., Utah	Aug. 12	Sept. 6	0.002½
Spider, Utah	Aug. 15	Sept. 15	0.002½
Tintic Standard, Utah	Sept. 9	Oct. 9	0.00
Torino, Ida	Aug. 15	Sept. 15	0.00
Utah Ideal, Utah	Sept. 6	Oct. 8	0.00½
Utah United Copper, Utah	June 24		0.01½
Verde May, Ida	Sept. 6	Sept. 21	0.000½
Victoria, Mich	Aug. 21		1.00
Wabash, Utah	Aug. 12	Sept. 2	0.10
Wasp No. 2, S. Dak		Aug. 31	0.02
Yankee Con., Utah	Aug. 18	Sept. 4	0.01

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	52.222	23.706	23.794	24.081
March	50.468	51.454	52.745	23.227	23.690	24.324
April	51.428	53.221	53.325	23.708	24.483	24.595
May	52.905	53.870	53.308	24.343	24.797	24.583
June	52.538	53.462	53.043	24.166	24.651	24.486
July	51.043	54.150	52.630	23.519	25.034	24.286
August	51.125	52.912		23.588	24.428	
September	51.440	53.295		23.743	24.567	
October	50.923	55.490		23.502	25.596	
November	50.703	55.635		23.351	25.680	
December	52.226	54.428		24.030	25.160	
Total	51.502	53.486		23.706	24.670	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12.611	59.388	54.970
March	13.255	12.139	13.586	12.447	59.214	54.704
April	12.733	12.019	13.091	12.275	57.238	54.035
May	12.550	11.989	12.885	12.214	56.313	54.313
June	12.404	12.385	12.798	12.611	55.310	56.368
July	12.215	12.463	12.570	12.720	54.194	56.670
August	12.490		12.715		55.733	
September	12.379		12 668		55.207	
October	12.553		12.788		56.722	
November	12.742		12.914		57.634	
December	12.581		12.863		56.769	
Year	12.738		13.039		57.054	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

TIN AT NEW YORK

Month	1910.	1911.	Month	1910.	1911.
January	32.700	41.255	July	32.695	42.400
February	32.920	41.614	August	33.972	
March	32.403	40.157	September	34.982	
April	32.976	42.185	October	36.190	
May	33.125	43.115	November	36.547	
June	32.769	44.606	December	38.199	
			Av. Year	34.123	

Prices are in cents per pound.

LEAD

Mohth	New York		St. Louis		London	
	1910.	1911	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459	4.394	4.307	4.238	13.063	13.122
April	4.376	4.412	4.225	4.262	12.641	12.889
May	4.315	4.373	4.164	4.223	12.550	12.984
June	4.343	4.435	4.207	4.292	12.688	13.260
July	4.404	4.499	4.291	4.397	12.531	13.530
August	4.400		4.290		12.513	
September	4.400		4.289		12.582	
October	4.400		4.271		13.091	
November	4.442		4.314		13.217	
December	4.500		4.363		13.197	
Year	4.446		4.312		12.920	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	5.518	5.419	5.368	23.188	23.276
March	5.637	5.563	5.487	5.413	23.031	23.016
April	5.439	5.399	5.289	5.249	22.469	23.743
May	5.191	5.348	5.041	5.198	22.100	24.375
June	5.128	5.520	4.978	5.370	22.094	24.612
July	5.152	5.695	5.002	5.545	22.406	25.006
August	5.279		5.129		22.800	
September	5.514		5.364		23.165	
October	5.628		5.478		23.900	
November	5.976		5.826		24.083	
December	5.624		5.474		24.019	
Year	5.520		5.370		23 050	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer		Basic		No. 2 Foundry	
	1910	1911	1910	1911	1910	1911
January	$19.90	$15.90	$17.98	$14.40	$17.94	$14.75
February	18.96	15.90	17.21	14.50	17.38	14.81
March	18.53	15.90	16.93	14.65	17.00	14.96
April	18.28	15.90	16.84	14.65	16.75	15.00
May	17.10	15.90	15.94	14.30	16.18	14.72
June	16.52	15.90	15.60	14.06	15.53	14.56
July	16.40	15.90	15.40	14.03	15.40	14.53
August	16.09		14.89		15.16	
September	15.92		14.73		14.93	
October	15.90		14.05		14.88	
November	15.84		14.26		14.78	
December	15.90		14.15		14.65	
Year	$17.10		$15.65		$15.83	

STOCK QUOTATIONS

COLO. SPRINGS Aug. 29

Name of Comp.	Bid.
Acacia	.02
Cripple Cr'k Con.	.01
C. K. & N.	.10
Doctor Jack Pot	.05
Elkton Con.	.59
El Paso	.51
Findlay	.04
Gold Dollar	.15
Gold Sovereign	‡.02
Isabella	.09
Jack Pot	.04
Jennie Sample	.06
Lexington	‡.01
Moon Anchor	.02
Old Gold	.03
Mary McKinney	.39
Pharmacist	‡.01
Portland	.96
Vindicator	.73
Work	.01

SALT LAKE Aug. 26

Name of Comp.	Bid.
Beck Tunnel	.15
Black Jack	.10
Carisa	.15
Cedar Talisman	.04
Colorado Mining	.43
Columbus Con	.31
Daly Judge	4.12
Grand Central	.99
Iron Blossom	1.07
Little Bell	.39
Lower Mammoth	.02
Mason Valley	7.00
May Day	.11
Nevada Hills	3.30
New York	.04
Prince Con	.68
Silver King Coal'n	1.60
Sioux Con	.27
Uncle Sam	.47
Yankee	15

TORONTO Aug. 29

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	6.50	Pearl Lake	.40
Hudson Bay	‡.75	Porcu. Gold	.45
Temiskaming	.39	Porcu. Tisdale	.04
Wettlaufer-Lor	.90	Preston E. D.	.29
Apex	.13	West Dome	1.30
Central	.78	Standard	.04
Dobie	.90	Foley O'Brien	1.02
Dome Exten	.70	Rea	3.18
Hollinger	10.20	Coronation	.10
Imperial	.08	Swastika	.43

SAN FRANCISCO Aug. 29

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	6.55
Belcher	.52	Jim Butler	.26
Best & Belcher	.13	MacNamara	.18
Caledonia	.46	Midway	.20
Challenge Con	.15	Mont.-Tonopah	.72
Chollar	.12	North Star	.15
Confidence	‡.56	West End Con	.57
Con. Virginia	.68	Atlanta	.16
Crown Point	.75	Booth	.08
Gould & Curry	11	C.O.D. Con	.09
Hale & Norcross	.21	Comb. Frac	.09
Mexican	3.77	Jumbo Extension	.20
Occidental	.50	Oro	.05
Ophir	1.67	Silver Pick	.06
Overman	.35	St. Ives	.33
Potosi	.17	Tramps Con	.02
Savage	.21	Argonaut	2.25
Sierra Nevada	.46	Bunker Hill	‡7.25
Union Con	1.55	Cent. Eureka	1.15
Yellow Jacket	.36	So. Eureka	‡7.00

N. Y. EXCH. Aug. 29

Name of Comp.	Clg.
Amalgamated	58
Am. Agri. Chem	50
Am.Sm.&Ref.,com	68
Am. Sm.& Ref., pf.	104
Anaconda	34
Batopilas Min	1
BethlehemSteelpf	60
Chino	18
Comstock Tunnel.	‡.20
Federal M.& S., pf.	50
Goldfield Con	5
Great Nor., ore ctf.	48
Homestake	82
Miami Copper	19
Nat'nalLead,com.	49
National Lead, pf.	104
Nev. Consol	17
Pittsburg Coal, pf.	17
Ray Con	13
RepublicI&S,com	25
Republic I & S, pf.	89
SlossSheffi'd,com.	38
Sloss Sheffield, pf.	112
Tennessee Copper	32
Utah Copper	42
U. S. Steel, com	69
U. S. Steel, pf.	114
Va. Car. Chem	52

N. Y. CURB Aug. 29

Name of Comp.	Clg.
Barnes King	‡.15
Braden Copper	4
B. C. Copper	4
Buffalo Mines	1
Butte & Vipond	.53
Butte Coalition	14
Calumet & Mont.	‡.20
Cobalt Central	.01
Con. Ariz. Sm.	
Davis-Daly	
Ely Con	
Florence	1
Giroux	4
Greene Cananea	6
Greenwater	.05
Guanajuato	‡3
Guerrero	‡1
Guggen. Exp.	185
Inspiration	6
Internat. S. & R.	‡124
Kerr Lake	4
La Rose	3
McKinley-Dar-Sa.	1
Min. Co. of A. new	4
Moneta Porc	.12
Mont Shoshone	‡.04
Nev. Utah M. & S.	
New Baltic	‡3
Nipissing Mines	7
Ohio Copper	1
Pacific Sm. & M.	
Precious Metals	‡1
Ray Central	1
Red Warrior	‡1
South Utah M. & S.	
Standard Oil	640
Stewart	.98
Tonopah	5
Tonopah Ex	.87
Tri-Bullion	
Tularosa	
Union Mines	.25
Yukon Gold	3

LONDON Aug. 30

Name of Com.	Clg.
Camp Bird	£1 9s 4½d
Dolcres	1 10 0
El Oro	1 3 3
Esperanza	1 15 0
Mexico Mines	0 17 6
Oroville	0 5 7½
Stratton'sInd.	0 1 9
Tomboy	0 18 3

BOSTON EXCH. Aug. 29

Name of Comp.	Clg.
Adventure	4
Algomah	3
Allouez	22½
Am. Zinc	22
Arcadian	‡2
Arizona Com	2
Atlantic	‡6
Bonanza	.50
Boston & Corbin	5
Butte & Balak	3
Calumet & Ariz	48
Calumet & Hecla	420
Centennial	8
Con. Mercur	.05
Copper Range	51
Daly-West	5
East Butte	9
Franklin	6
Granby	29
Hancock	19
Hedley Gold	15
Helvetia	1
Indiana	6
Isle Royale	13
Keweenaw	2
Lake	23
La Salle	4
Mass	5
Michigan	2
Mohawk	38
New Arcadian	2
North Butte	23
North Lake	4
Ojibway	4
Old Dominion	35
Osceola	86
Parrot	9
Quincy	65
Shannon	8
Shattuck-Ariz	15
Superior	22
Superior & Bost.	3
Tamarack	23
Trinity	3
Tuolumne	4
U. S. Smelting	32
U. S. Smelt'g, pf.	46
Utah Apex	2
Utah Con	12
Victoria	17
Winona	5
Wolverine	100
Wyandot	.90

BOSTON CURB Aug. 29

Name of Comp.	Last
Ahmeek	150
Bingham Mines	1
Boston Ely	1
Boswycolo	10
Cactus	11
Calaveras	1
United Verde Ext.	.40
Chief Cons	.80
Corbin	.95
Cortez	1
Crown Reserve	2
First Nat. Cop.	.99
Live Oak	18
Majestic	.42
Mazatan	‡1
Nat'l Mine & Ex.	.10
Nevada-Douglas	2
Oneco	1
Raven Copper	.29
Rhode IslandCoal	1
San Antonio	‡3
South Lake	4
Trethewey	.75
United Zinc, pfd.	‡2
Vulture	5
Yuma	‡.02

‡Last quotation.